INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

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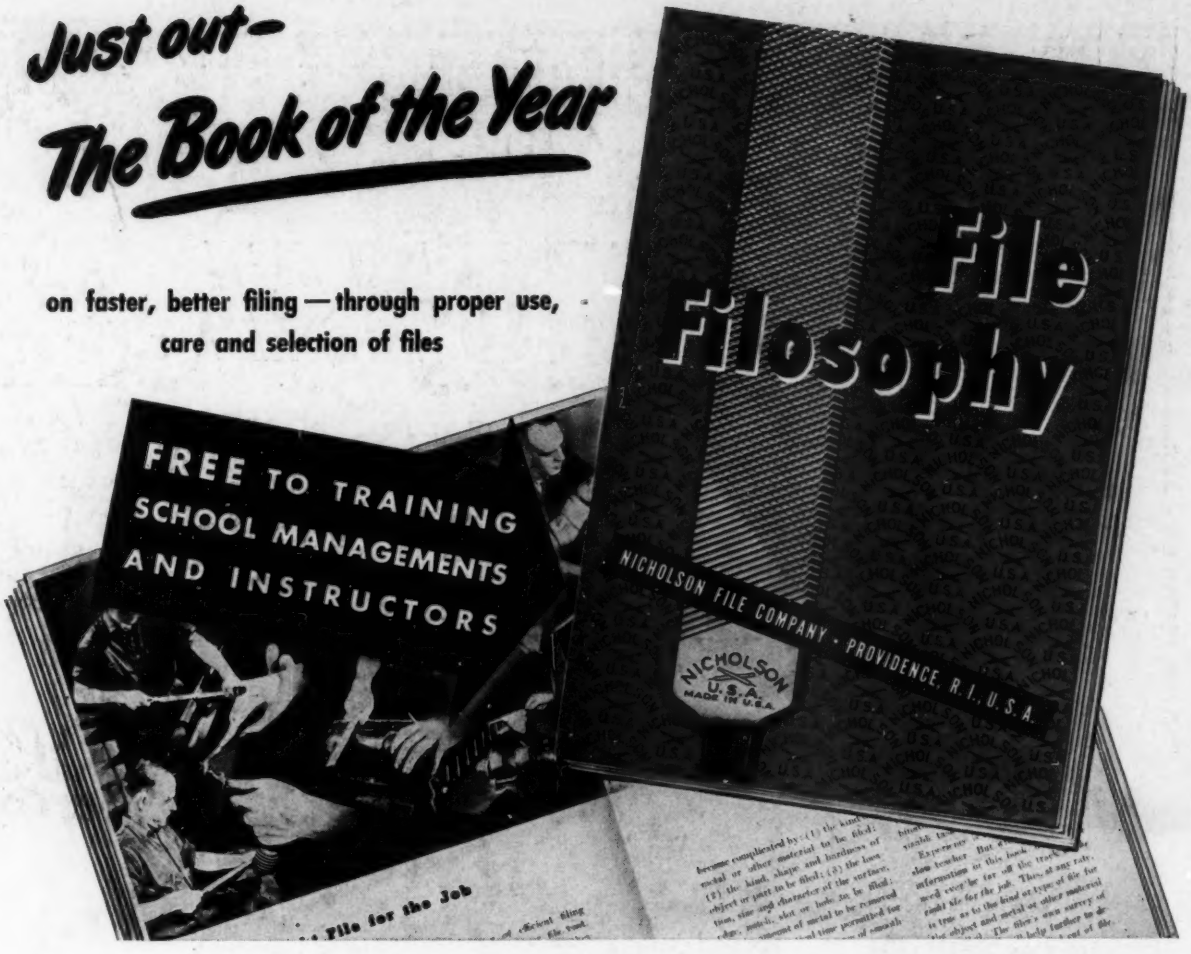
The Shop Teachers' Professional Magazine

FEBRUARY, 1943 VOL. 32, No. 2

Just out—
The Book of the Year

on faster, better filing — through proper use, care and selection of files


File Filosophy
NICHOLSON FILE COMPANY • PROVIDENCE, R. I., U. S. A.
NICHOLSON
U. S. A.
FREE TO TRAINING SCHOOL MANAGEMENTS AND INSTRUCTORS

AN AID to America's war effort and industrial progress! A help to mechanics, "trainees," classroom and school-shop instructors! A Nicholson contribution to greater production speed and efficiency, greater conservation of time, materials and files!

"FILE FILOSOPHY" has been prepared with infinite care. It reflects the experience of 79 years of industrial filing engineering, file designing and quality file manufacture. It contains the best portions of fifteen editions of a previous file treatise printed under the same title. To it has been added much of the contents of a supplemental Nicholson book, "A File for Every Purpose." Still more has been added to cover today's advances in shop practices and specialization, and new developments in materials and products.

"FILE FILOSOPHY" is a simple discourse—as understandable to the mechanic as to the instructor or production head.

"FILE FILOSOPHY" is an excellent "textbook" for the school-shop. It is particularly helpful in teaching students the proper use and care of files, and the why-and-wherefore of *The right file for the job*—for today the Special Purpose file has an important place on the production fronts, in the tool-maintenance and mechanical-development departments. (There are many such files in the Nicholson and Black Diamond lines—available through mill-supply and the better hardware houses.)

48 INTERESTING, PROFUSELY ILLUSTRATED PAGES

How a quality file is born • A bit of file history • File terminology • Mill files • Machinists' files • Rasps • Swiss Pattern files • Curved Tooth files • How to get the most out of files—through proper use, care and selection • Draw filing and Lathe filing • Special Purpose files: for rough castings, die castings, stainless steel, aluminum, brass, lead, plastics, smooth finishing on soft metals • Saw files and Saw filing • Precision filing • Sharpening tools and implements.

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47 Acorn St., Providence, R. I.

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(Also Canadian Plant, Port Hope, Ontario)

THESE WOMEN, MACHINING PRECISION PARTS ON SOUTH BEND LATHES IN A VITAL WAR PLANT, ARE TYPICAL OF THOUSANDS OF WOMEN WHO ARE DOING THEIR PART TO WIN THE BATTLE OF PRODUCTION

WITH THEIR HELP *We'll Win*

With eager hearts and nimble fingers, thousands of American women are working shoulder to shoulder with men in vital war industries—replacing those who have left their machines to defend their country. And they are doing a fine job of filling men's shoes, for they know that the battle of production must be won to keep their men at the front supplied with the guns, planes, tanks, bullets, and thousands of other things that an army must have to be victorious.

Women learn to operate South Bend Lathes in a surprisingly short time. Not that just any girl can become an expert machinist or toolmaker overnight. But on certain classes of work—the kind of work that you would expect a beginner to do—women are highly successful.

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In many schools where special shop courses for women are conducted, South Bend Lathes have proved ideal for pre-employment training. Write for Catalog 100-B.

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South Bend training helps—books, sound films, wall charts, and service bulletins on the care and operation of a lathe—are available for speeding up the training of new operators. Write for your copy of Bulletin No. 21-C.

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LATHE BUILDERS FOR 36 YEARS SOUTH BEND, INDIANA, U.S.A.

PROTECT STUDENTS' EYES FROM GRINDING HAZARDS!

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FIXTURE CAN BE PIVOTED OUTWARD TO REMOVE BULBS
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RUBBER PADS UNDER CLAMPS
SAFETY GLASS ON TOP, WINDOW GLASS UNDERNEATH
GLASS SIZE 4" x 6"
STURDY DIE CAST FRAME

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Gives positive eye protection with excellent light directly on the work. Adjustable up and down for standing or sitting position. Cannot be moved to non-guarding position without dismantling. Can be easily applied on bench or belt-driven grinders. Write for details. Stanley Electric Tool Div., The Stanley Works, 112 Elm Street, New Britain, Conn.

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STANLEY Electric Tools

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The comprehensive electrical shop text you've been looking for—

Perry and Schafebook's

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121 carefully selected and tested projects, giving students a broad knowledge of electrical theory and its practical applications in everyday life. Step-by-step instructions for each job and clear illustrations let the student progress at his own rate of speed. With the jobs are included a wealth of information, helpful suggestions for the care of equipment, explanation of electrical terms, operation check lists, and tests for all types of new work covered. $2.20

Send for a copy on approval.

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FOR QUICK, ACCURATE TRANSFER

In the school shop it pays to have good tools—especially when, like Lufkin, those tools are identical with those used by best mechanics and engineers in industry. In these Lufkin spring Dividers and Calipers special steel, hardened points and the stiff flat bow spring insures reliability. Available with either solid nut or "Quick Nut."

For quickly and accurately transferring measurements you can't beat Lufkin Dividers and Calipers.

TEACH GOOD WORKMANSHIP WITH GOOD TOOLS

LUFKIN

SAGINAW, MICHIGAN · NEW YORK CITY

TAPES · RULES · PRECISION TOOLS

February, 1943

February, 1943, calls for more than routine observance of patriotic occasions. In this wartime year, February is a month for rededication to our wartime tasks... remembering our duty to keep the faith with the men who made America.

All over the country, schools are keeping the faith—by their outstanding accomplishments in educational and community activities for wartime service.

Schools are forging ahead—in spite of crowded classrooms, in spite of a shortage of teachers, in spite of the extra burdens brought about by the war.

In many instances, helpful solutions to new wartime problems have been developed through the use of the Mimeograph duplicator and its integrated stencil sheets and inks.

Mimeograph duplication gives teachers more time for teaching—and for the many extra activities of wartime—

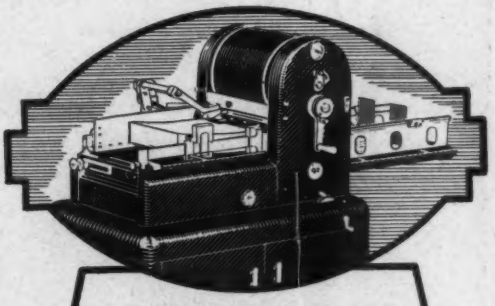
by easing classroom routine

producing needed materials when textbooks are not available

helping keep all classroom materials up to date

helping produce all the special items which are needed this month when Lincoln's Birthday, Valentine's Day, and Washington's Birthday follow each other in quick succession.

Help your school make the fullest possible use of its Mimeograph equipment. For practical suggestions and trained assistance, call the Mimeograph distributor in your community, or write to A. B. Dick Company, Chicago.



Mimeograph duplicator

Mimeograph is the trade-mark of A. B. Dick Company, Chicago, registered in the U. S. Patent Office.

Versatile Mimeograph duplicators can help with almost all the important work schools have to do these war days. Model 92 is shown at left.

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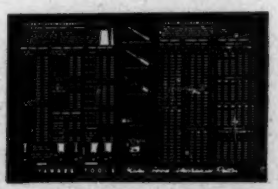
ARE THE FIRST REQUISITE IN THE MAKING OF A CRAFTSMAN

Two principles determine the design and manufacture of "Yankee" Tools: (1) They must make work quicker and easier than other tools manufactured for similar work; (2) they must be precision-built, tested and retested for quality and dependability. . . . Strict adherence to these principles has made "Yankee" Tools the favorites with good mechanics and the instructors of good mechanics for more than a half century. That is why the war-time demand for "Yankee" Tools is greater today than our ability to make them immediately available for vocational needs.

FREE! This handy "Yankee" Reference Chart features tables of relative screw driver blade and screw sizes, and includes graphic instructions on how to drive screws correctly. Write for your copy.



"YANKEE" TOOLS

make good mechanics better

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Established 1880

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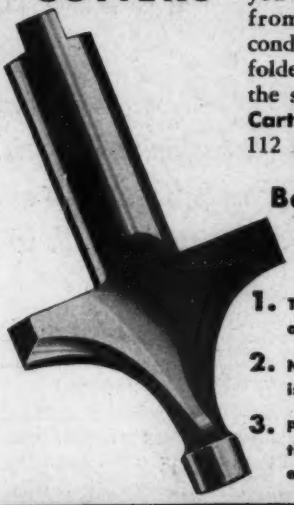

● With only a few Bits and Cutters from Carter's extensive stock, your students can cut an endless variety of interesting contours, patterns, and ornaments. Precision built from selected steel, Carter Bits and Cutters will give you the extra long service you need from your equipment under present conditions. Write for a descriptive folder and see how surprisingly little the supply you need will cost. **R. L. Carter Division,** The Stanley Works, 112 Elm Street, New Britain, Conn.

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1. **The pilot tip guides the cutter along the outline of the work.**
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★ ***IT'S WATERPROOF***
. . . joints submerged in water a year show no signs of yielding.

★ ***IT'S STRONG***
. . . glue stronger than the wood it joins. Wood gives way but the glue will not yield.

★ ***IT'S EASY TO USE***
. . . in 30 seconds glue is ready for use. Mixes readily with hot or cold water.

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4 HANDY SIZES
10¢ 25¢ 50¢ 85¢

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WALKER-TURNER MACHINE TOOLS Help Train Aircraft Mechanics at Casey Jones SCHOOL OF AERONAUTICS

Upper Walker-Turner Radial Drill, being operated by a girl student at Casey Jones, drills to center of 62" circle.

Lower Walker-Turner Floor Model Drill Presses in use at Casey Jones School of Aeronautics, Newark, N. J. Made in several sizes up to 20", in both floor and bench models.

At Casey Jones School of Aeronautics, Walker-Turner Machine Tools have given splendid results in a vitally important training program. And this has been the experience of hundreds of other vocational schools filling the manpower needs of the armed forces and war industries. There are several important reasons for this:

1. Simplified design makes Walker-Turner Machine Tools easier for the student to understand and operate.
2. Avoidance of elaborate controls and involved mechanisms makes them safer, eliminating the time-wasting "jitters" stage when the student is first introduced to the machine.
3. They give the students valuable experience on the same machine tools they will encounter in industry.

Furthermore, Walker-Turner Machine Tools are priced to fit vocational school budgets and are available promptly for war production training. Send for new catalog.

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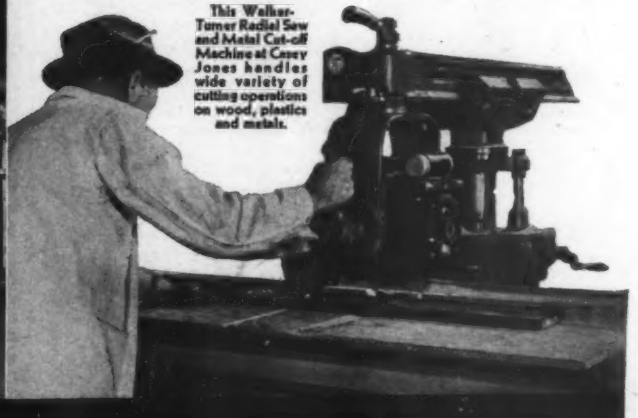

This Walker-Turner Radial Saw and Metal Cut-off Machine at Casey Jones handles wide variety of cutting operations on wood, plastics and metals.

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MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

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Helping the School Fill Industry's Need *for* Well-Trained Men

Trained workers—able to step into wartime jobs in a minimum of time—are industry's great need today. Using Atkins Silver Steel Saws in your manual training rooms can be a big help to you in filling that need. Correctly-designed by expert Atkins saw makers, these quality tools cut accurately, with a minimum of effort. There are types for every kind of sawing in wood, metal and plastics. Full information on the complete Atkins line is available on request.

Free to Manual Training Instructors—

NEW WALL CHART ON SAW FITTING

Teaching the fundamentals of fitting hand saws is greatly simplified with this new Atkins Chart. Illustrates and describes in detail the right way of filing and setting teeth of hand, rip and panel saws. Suitable for wall mounting —19" x 25" in size. Write for free copy.

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18-inch Band Saw

The Oliver No. 192 Band Saw is built with quality materials, expert workmanship, and includes adjustments, safety guards, etc., the same as the larger machines. It operates from a light socket. It will saw wood or metal.

Rips to 11 inches wide. Cross cuts and miters up to eight inches. Table tilts 45° to the right. Ball bearing throughout. Actual space occupied by this machine is 23 inches by 33 inches.

This machine, the No. 192, is ideal for school shop use. Many have been installed in school shops throughout the nation.

"Oliver" Junior Line Catalog fully describes this and other "Oliver" Portable Machines. Ask for it.

OLIVER MACHINERY COMPANY
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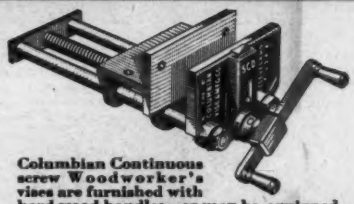
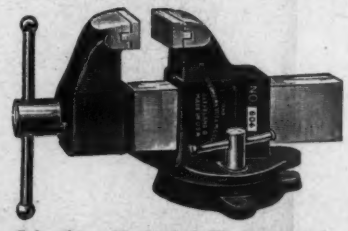
INDUSTRY'S FIRST CHOICE FOR OVER THIRTY YEARS



Columbian Continuous screw Woodworker's vises are furnished with hard wood handles—or may be equipped with ADJUSTABLE STEEL HANDLES, as above, to eliminate handle breakage, speed operation and provide extra leverage.

The complete line of Columbian Vises is designed to excel in its field—all are made to the same high standard of engineering and workmanship. A vise for every need and purpose.



Columbian Machinist's Vises are made of malleable iron castings, guaranteed unbreakable, and designed to provide accurate, dependable equipment for school and industrial shops. All standard types.

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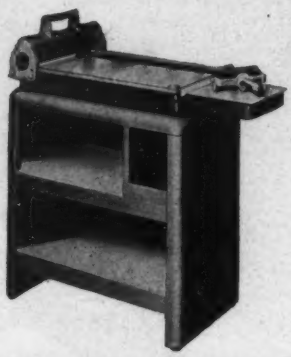
THE WORLD'S LARGEST MAKERS OF VISES

SCHOOL PRINTING PLANTS by ATF

For the complete school printshop—from the small general printing unit to the large vocational trade training unit—ATF has everything you need to equip your plant with modern, safe equipment. ATF Education Engineering Service is available to help you lay out a new plant, or revise your present setup to provide more modern facilities. There is no charge for this service. Consult your ATF sales representative, or write to the American Type Founders Education Department.



For School Printshops—No. 0 *Vandercook* Proof Press

There are no Vandercook Proof Presses made for use in schools only. Every Vandercook is a professional proof press...the same as those used in the finest commercial printing plants. It pays to teach on the equipment your students will use later if they decide to become printers. All great printing plants use Vandercook proving equipment. Ask your ATF representative or write for complete details.

VANDERCOOK

"The Best Type in Any Case!" ATF TYPE

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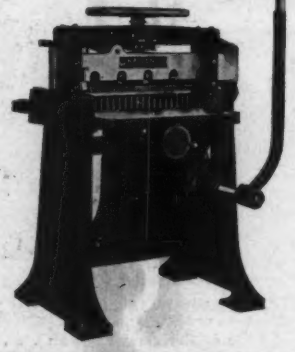
Specimen sheets of ATF types are available for class use.



Safe! The *Challenge* Lever Paper Cutter

A strong well-built cutter that is highly recommended for the school printshop. Operates easily, smoothly, cuts accurately. Made in two sizes: 26½ inch and 30½ inch. Equipped with safety lock that prevents accidental descent of knife. All-steel lever is scientifically curved to provide maximum leverage. Structural features include solid center support, overhanging arch; easily squared back gauge; duplex steel measuring tape, graduated in both 1/12 and 1/16 inches; and six-spoke clamp wheel.

A *Challenge* PRODUCT

Hamilton Equipment for Schools

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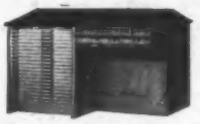
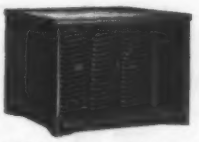


No. 12013-D School Type Cabinet



No. 13983 Imposing Table 51439

The full line includes several styles of type cabinets and imposing tables designed for vocational instruction needs ...and many auxiliary cabinets for binding work and other purposes.

MADE BY *Hamilton*

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— a War Production Fundamental

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- Students like to work with Kester Flux-Filled Solders. Self-contained flux eliminates messy flux-pots, makes learning quicker and easier! Your students — and you — will be proud of the expert soldering they'll do.
- It's knowledge that will stay with them, that will be valuable whether they use it in their work, or merely as a means for money-saving home repairs.
- If only to lighten your own work and eliminate the danger of flux-spattered floors and benches, teach soldering with the material that's fundamental in American industry — Kester Flux-Filled Solder! Order from your wholesaler.

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4257 Wrightwood Avenue Chicago, Ill.
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FLUX-FILLED SOLDER

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ARMSTRONG
TOOL HOLDERS AND TOOLS

Teach with the tools actually used in industry.

With ARMSTRONG TOOL HOLDERS—used in over 96% of the Machine Shops and Tool Rooms. Develop "tool sense" and a love for fine tools with ARMSTRONG Drop Forged WRENCHES—Carbon and Chrome-Vanadium Steel Open End Wrenches; Box Socket improved designs, better balance, finer and Detachable Socket Wrenches with machining and finish. Set up jobs with modern, safe ARMSTRONG Drop Forged Setting-Up Tools. Use ARMSTRONG Drop Forged Clamps that never slip, spring or spread, and ARMSTRONG Drop Forged Lathe Dogs that are standard everywhere.

Write for Cutter Grinding Charts and new O-39 Catalog. Sent to Instructors upon request.

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"The Tool Holder People"
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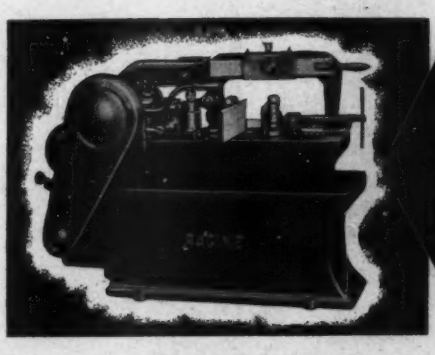
Eastern Warehouse & Sales Office: 199 Lafayette St., N. Y.

A SMALL MACHINE FOR A BIG JOB IN VOCATIONAL TRAINING!



RACINE
HYDRAULIC
UTILITY SAW

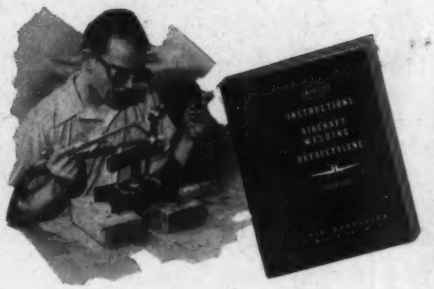
Yes . . . the RACINE Hydraulic Utility Saw is small . . . doesn't take up a lot of much needed space . . . BUT it is doing a mighty BIG JOB in the field of vocational training.

The RACINE Utility Saw is no plaything. It is a solidly built small scale model of the famous RACINE Cutting Machine line doing an important job in war production plants all over the country every day.

The RACINE Utility Saw does all kinds of cutting operations . . . including angles of 45 degrees. It operates on the same principle and controls as does its bigger brother. Young men trained in vocational schools with RACINE equipment are prepared to step into the factory with a sound practical understanding of actual cutting operations.

RACINE TOOL & MACHINE CO.
1761 State Street Racine, Wisconsin, U. S. A.

Train Better Welders Faster with these Airco Instruction Books



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Vol. 1, Lectures. Introduces the student to fundamental gas welding methods. It explains the design and operation of welding and cutting torches, tips and regulators and describes properties of various metals as well as practical welding methods used in industry. **Vol. 2, Exercises,** presents a series of carefully planned exercises that help the student to quickly learn practical methods for welding the most commonly used metals. Each volume is bound in a hard cover. Price $1.00 per copy.

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This volume provides a well-planned series of workroom exercises that demonstrate the specialized techniques used in oxyacetylene welding for the aviation industry. Its 36 pages are profusely illustrated to show clearly proper torch manipulation, application of filler metal, and methods for making all types of welds used in aircraft fabrication.

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IDLE CYLINDERS ARE PRODUCTION SLACKERS: *Keep 'em rolling for victory!*

The 1943 Shop Annual

OF INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

Wartime Service Edition

War-Production Training is the "directive" now governing all industrial arts and vocational education work.

War-Production Training now keynotes the editorial service of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. The 1943 SHOP ANNUAL NUMBER — our second Wartime Service Edition — will again provide essential up-to-the-minute information on wartime school-shop organization, shop layout, equipment, and operations for the instructional forces of the nation.

READY FEBRUARY, 15, 1943

The SHOP ANNUAL NUMBER summarizes the periodic progress in the field of industrial arts and vocational education, emphasizes the new developments ahead, presents through actual shop layouts and equipment lists, the best methods of accomplishment in the school shop field. The service of the SCHOOL SHOP ANNUAL NUMBER (regular March issue) of INDUSTRIAL ARTS AND VOCATIONAL EDUCTION is

1. It renders a comprehensive service promoting the introduction, progress, and expansion of industrial arts and vocational education.

2. It provides an authoritative source of information and guidance in organizing, planning, and equipping school shops.

Single Copies $1.00 — Yearly Subscription, including Shop Annual Number, $2.50

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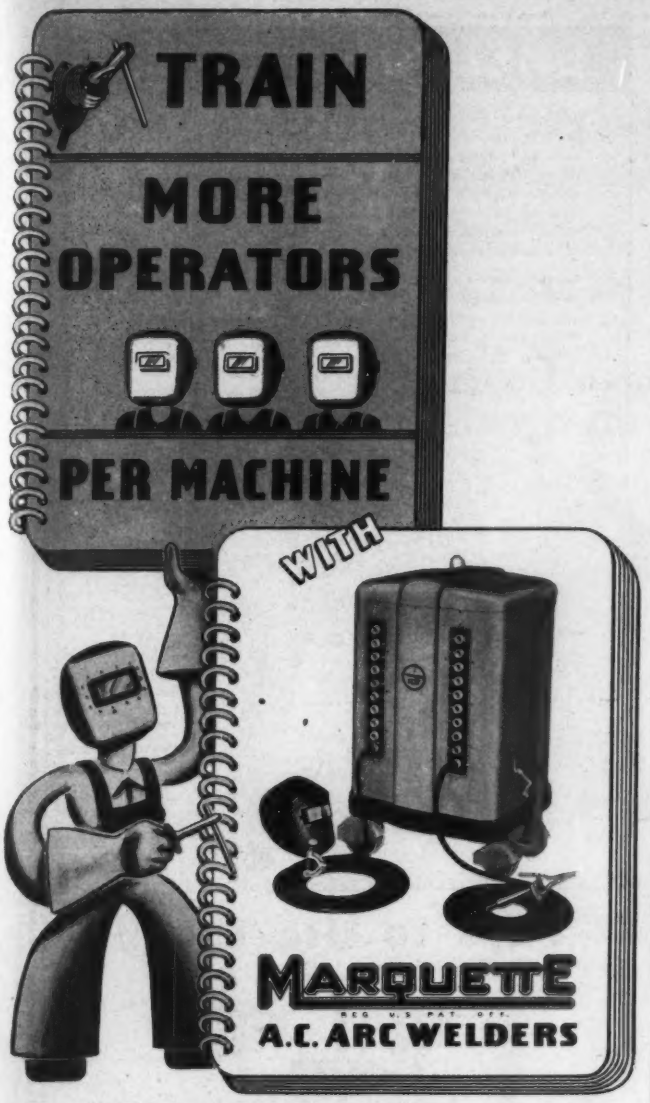

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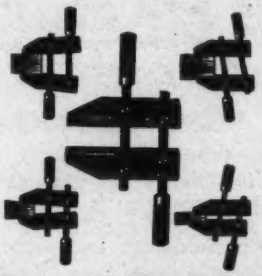

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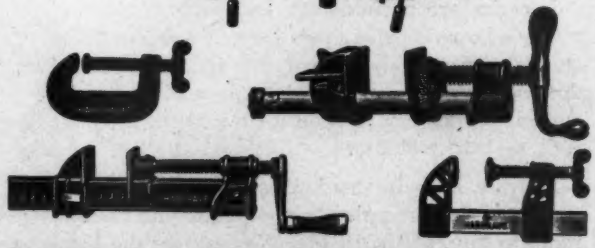

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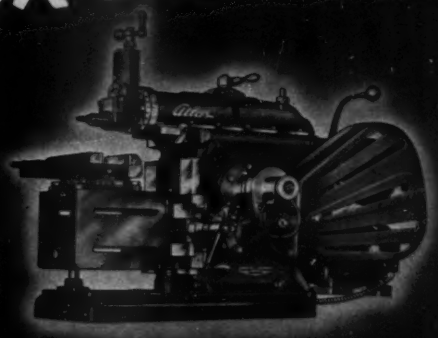

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

VOL. 32 FEBRUARY, 1943 Number 2

THE BONDS WE DIDN'T BUY

'Tis a mighty task, my brother,
This of waging Freedom's war;
And we'll need a brand of courage
That we've never known before:
But the Vict'ry that awaits us,
And no tyrant shall deny,
Won't be had by "wishful thinking,"
Nor the "Bonds We Didn't Buy!"

Those we love will strive undaunted
In the sky! On land and sea!
And they'll not renege at dying,
For the "likes of you and me":
And there'll be no turning backward
Of the lads within the ranks—
But the measure of their effort
Is of Planes—and Guns—and Tanks!

What of him who faces battle,
And a Nation's fate at stake?
Waiting! Hoping! Vainly pleading!
For the "things we didn't make!"
What of broken lines that falter;
Pay the penalty—and die?
All for needless lack of something
Bought with "Bonds We Didn't Buy!"

. . . And a chapter would be written
Should "they" fail to "see it through"
Of a beaten, cringing people
And the task *we* failed to do:
There would be a despot's emblem
Where "Old Glory" used to fly,
O'er a once proud land! Grim token of . . .
The Bonds We Didn't Buy!

— Courtesy, Adam N. Reiter, West Chester, Pa.

THIS MONTH'S COVER

The cover picture shows how the nose section of a Lockheed P–38 pursuit plane is mated with the center section. Then the partly finished ship will travel down the assembly line ready for the installation of engines, wings, landing gear, and other essential equipment.

Photograph, courtesy of Office of War Information.

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To date, forty-two brief articles similar to the one above and dealing with the more commonly used woods have appeared in these ads. As in the past, we continue to invite your suggestions as to the species of wood you would like featured in this series.

YATES-AMERICAN

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

Effective Teaching*

HARRY A. PEDERSON**

The efficiency of a mechanic is based primarily on his mastery of the fundamentals of his trade. The effectiveness of a teacher is controlled similarly by the application of fundamental principles. In time of war our need for efficiency is of first importance. The purpose of this lesson is to focus attention on some practical procedures in common use by the best teachers.

1. *How can a teacher best gain the respect of his students?*

a) By knowing the subject.

Knowledge of the subject is, of course, one of the most vital requirements basic to effective teaching. A man who knows his subject thoroughly usually appeals to the learners. They become eager to share his experiences. He should know much more than is necessary to teach the daily lessons. In addition, the instructor will find that students will respect him more if he keeps himself informed on new techniques and processes in his particular field.

b) By varying the method of presentation.

The same method used over and over soon becomes monotonous. The instructor should realize that interest is increased when various approaches are used. The nature of the lesson sometimes calls for only one procedure. However, variety in method is usually possible. In some instances the demonstration is most effective. In other cases the lecture, the conference, or discussion may be superior. Charts, models, and diagrams used in conjunction with any method may be needed to *clinch* the point. Illustrated lectures find a place in effective presentation. Motion pictures have distinct value, if the learners have been taught what to look for, and have been checked to see that important points are learned.

c) By using no sarcasm or ridicule.

The use of sarcasm and ridicule places the learner on the defensive. When he is in this condition he is not ready to learn. A resentful student places an extra burden on the instructor, for it is necessary to replace the unpleasant feeling of resentment with a pleasant feeling. Furthermore, other students in the class are likely to be annoyed and thus not in a state of readiness to learn.

d) By being sincere.

Sincerity is a trait that appeals to most people. Such a trait helps to bring about a readiness to learn in the student. If one does not believe in what he is doing, his effectiveness is lessened. This in turn retards learning. When an instructor indicates directly or by his actions that he thinks his subject is of little value, the students become confused and lose interest in the work.

e) By planning each lesson.

Effective teaching cannot be done unless the instructor carefully plans his lesson. The form of the plan will vary according to the material to be presented. The following points should usually be included, however. They will be given detailed treatment in the lesson "Planning the Daily Lesson."

(1) Review.

A brief summary of the high lights of the previous lesson.

(2) Objective.

The objective may be taken from the analysis. It is a statement of what the student is expected to learn.

(3) Motivation.

The techniques to use in order to develop in the students an active desire to learn.

(4) Instructional steps.

After the goal of the lesson is stated, each step necessary to reach that goal is listed in a logical manner.

(5) Method.

The method to be used in presenting a given lesson will be determined by the objective, the teacher, the students, the time, and the equipment. Regardless of the method or combination of method chosen, it is important that the instructor make a list of all tools, equipment, visual aids, and supplies needed to teach the lesson.

(6) Questions.

The place of questions in the lesson plan will vary according to the material presented. They should be designed to check the student's understanding and to correct errors as well as detect them.

(7) Summary.

A skillful teacher will include a summary at the end of his lesson plan. This summary will consist of specific points that will serve to impress the key points of the lesson on the minds of the learners.

(8) Assignment.

The assignment is related to the review in that it shows the relationship of one lesson to another. Specific things that the students are to do must be listed.

(9) Suggestions for improvement.

After the lesson has been given, notes may be written on the plan about unforeseen difficulties that arose, changes in method, and the like.

The lesson plans that experienced instructors make are likely to be briefer than the plans of inexperienced instructors. However, *every* teacher *must* have a written plan that is detailed enough for the purpose. Carefully writing a plan clarifies one's thinking and lessens the chance of gaps occurring in the presentation.

f) By making few rules, but following the few strictly.

Rules of conduct should be explained carefully during the first meeting of the class. Each student should be tested or questioned in some manner to make sure that each rule is understood thoroughly. If the work is of such nature that general safety rules should be observed, these regulations must be made known to the students early in the course. Students respect a man who impartially enforces clearly stated rules of conduct and safety.

*This is the fifth of a series of articles on presentation of lessons from staff members of the Teacher Training Department, Armored Force School, Fort Knox, Ky. Brig. Gen. S. G. Henry is the commandant of the school and Lt. Col. Verne C. Fryklund is director of teacher training. Trade Analysis and Human Relations were taught in the school prior to teaching the content of these articles. The articles will not appear in sequence. Certain details referring to the military have been deleted.

**Teacher Training Department, Armored Force School, Fort Knox, Ky.

g) By being fair.

Every teacher must school himself to deal justly with all students. He must not grant special privileges to some persons merely because they have engaging personalities or because they are aggressive. Square dealing pays big dividends in teacher satisfaction and in student achievement.

2. *Why should the learner achieve some measure of success early in the course?*

Many beginning students are timid. The sight of a tank motor to be repaired, for example, may cause the student to become uncertain. He may conclude that the job is too big for him. However, if the instructor appreciates the problem of the learner, he will make an effort to insure immediate success. The first jobs performed by the student should be as simple as possible. By completing the first jobs in an acceptable manner the student will attain a feeling of satisfaction, and such a feeling builds confidence. Succeeding jobs will be attempted with more assurance of success.

3. *Why is the first meeting of the class important?*

It is important because many of the students arrive at the first meeting with an indifferent and sometimes even hostile attitude. These students must be shown that the teacher knows his subject and knows how to present it. All routine matters, such as passing out books, filling out blanks, assigning seats, and the like, should be carefully planned and quickly executed. It is advisable to start action as soon as preliminary routine matters are finished. A successful first class creates good feeling between the learners and the teacher and succeeding lessons will be easier to *put across.*

4. *How is the law of readiness stated?*

To do those things we want to do is satisfying. Not to do those things for which we have desires is annoying. To be forced to do those things for which we have no desires is also annoying.

5. *How can a state of readiness be brought about in the student?*

The instructor can show the student a need for learning the lesson. One way to do this is to have the lesson well planned so that the learner knows exactly what is to be learned. Another way is to illustrate the applications that will be made of the lesson. Sincerity and enthusiasm on the part of the instructor will also help to bring about a state of readiness in the learner. Interest and readiness are closely associated. In this respect the instructor must sell the subject to the class. He must get them interested in the work to be done and thus ready to learn. Spontaneous interest will not be forthcoming from all students, but interest can be developed or transferred, and this is what the instructor should strive for.

Under normal conditions every good instructor will conform to the points named above. In time of war it is doubly important to get the students ready to learn. A few minutes spent stressing the importance of everything taught will undoubtedly inspire the learners to be dissatisfied with anything less than their very best.

6. *How is the law of effect stated?*

The individual tends to repeat the things that are followed by pleasant feelings and tends not to repeat the things that are followed by unpleasant feelings.

7. *In what way might an understanding of the law of effect be put to use by an instructor in teaching situations?*

In the first place, the objective of the lesson should be clear and the presentation should be logically executed so the student has a good chance to succeed early. Secondly, the learner should be told how well he has succeeded in doing what he set out to do. When a student is commended for satisfactorily completing simple beginning units of work, he experiences a feeling of satisfaction and tends to attack new learning experience with greater zest. Learning is made pleasant and habits are thus more readily formed. Praise should not be lavish. It should be sincere and specific. Recognition of good work should usually precede criticism. Constructive criticism should also be impersonal and specific in nature.

8. *How is a habit formed and what is its importance in effective teaching?*

A manipulative operation should be performed by the students immediately after the demonstration. Every step should be done correctly the first time and repeated without variation until each step becomes automatic. Skills need to be repeated correctly until they are automatic. It should not be necessary for a person to deliberate on how an operation should be performed. When well learned, he performs the operation automatically — without pause for deliberation. Skills must be developed to the point where there will be accuracy, speed, and confidence of such degree as to get the necessary work done. These three words (accuracy, speed, confidence) should be kept constantly in mind by the instructor of manipulative subjects, for they define the goal toward which he is striving in teaching every operation.

9. *What is the effect of helping the student too much?*

A learner learns to do by doing. He must be shown exactly how to do the work, but the instructor must also avoid giving more help than is actually necessary. The student must be given all of the help needed, but he must not get into the habit of asking the instructor to solve all of the problems that arise. A simple rule to be followed in such instances would be: Give the student all of the help he *needs,* but do not do his work for him.

10. *What would be the probable outcome of not helping the student enough after a demonstration?*

The student probably would strive to do the operation by the trial and error method. This would tend to cause the formation of incorrect habits and make more difficult the development of the habit desired. Teachers must ever keep in mind that a skill is a habit and that a habit is formed by doing the operation correctly the first time and repeating it correctly until it is firmly established.

11. *Why is it undesirable for a teacher to become too familiar with his students?*

An attitude of friendliness and a genuine interest in the student is necessary. However, there is a danger in adopting a "one of the boys" attitude. The students become suspicious of the instructor's ability and a condition develops that is detrimental to learning. A teacher must maintain control of the class at all times. Familiarity leads to laxity.

12. *What is meant by the expression "learning to work"?*

Teaching techniques have been developed for the purpose of making learning effective. Learning is easier when teaching is efficient. However, even under the most ideal conditions, much hard work is required in order to develop skills and master information and basic principles that are so vital in solving problems. Bright students, of course, will easily learn material that is difficult for dull students. Nevertheless, all students will find that learning involves hard work when it concerns material near their capacity level.

13. *Why should immediate needs be stressed by the instructor?*

The ultimate objective of a course should be made clear to the learners. However, many students find it difficult to do their best work unless the need for each lesson has been made known by the instructor. When the reason for each lesson is apparent, the learner is more likely to become ready to learn it. As the competent instructor proceeds with the work of the course, there is less and less need to point out the immediate ends to be achieved because the students can better understand what is to be attained. Achievement of a remote goal affords satisfaction, but not all lessons on the way to this goal are pleasant. It is therefore important to emphasize present needs.

14. *What should the teacher do if asked a question he cannot answer?*

The proper thing for the instructor to do is to admit he does not know. He should, however, promise to find out and give the answer to the class the next day. It is a poor policy to bluff, because eventually it will be discovered and the confidence of the student in the instructor will be lessened.

15. *Should profanity ever be used in the classroom?*

Profanity should never be used in teaching. It tends to show a display of temper and lack of tolerance. Courtesy and profanity do not mix readily.

16. *Why is it desirable to use good English when teaching?*

In the Armored Force School it is necessary to quickly prepare men to do the work that needs to be done. Therefore, the instructor should choose words that convey exactly what he has in mind. Technical words must be used sometimes, but these words should be explained in simple language the first time they are used.

17. *Why is it necessary to explain a new assignment?*

Learning proceeds from the known to the unknown. The instructor, in explaining the assignment, should show that the new lesson is an outgrowth of lessons already learned. He can interest the students in the work and influence them to master it. Methods of doing the assignment should be suggested. Technical words and terms may need explanation. Assignment sheets, outlining precisely what is to be done, are helpful.

18. *How can a teacher make use of the different senses to make teaching more effective?*

This question is answered more in detail in the lesson on "Visual Aids." It is sufficient to say that learning is made more certain when more than one sense is stimulated. Pictures, diagrams, sketches, objects, and the like serve to intensify impressions in the student's mind. He must see how something is done, hear how it is done, and try to do it himself.

19. *What effect could a teacher's peculiar mannerisms have upon the students' progress?*

A mannerism is defined as an excessive adherence to certain peculiarities. Students seem to agree that some mannerisms are very annoying. For example, in a recent series of supervisory visits, it was noted that one instructor constantly pulled up his sleeves, another repeatedly ran his fingers through his hair, another cleared his throat after every sentence. These and similar mannerisms are very distracting to the learners. Their attention is diverted from the subject of the lesson part of the time. As a result learning is less effective. When there is much to be learned in a short period of time, the students can ill afford divided attention.

Learning is a cumulative process. New facts and ideas are combined with previous experience to form new concepts. Irritating mannerisms, therefore, definitely retard a student's progress because gaps are likely to occur which makes the formation of correct associations more difficult.

Teaching emphasizes the formation of correct habits. In order to develop proper skills and knowledge, the principles of good instruction must be known and applied. Poor teaching is more likely to be the result of failure to observe the points mentioned in this lesson than because the instructor is short on subject matter.

Vocational Training for Defense Workers

R. B. McHENRY*

A Broadcasting Script

STATION: KVOO, Tulsa.

DATE: July 13.

TIME: 4:30 to 4:45 p.m.

BIZ (Sound of airplane warming up): Fade into music.

MUSIC: Appropriate march, up 10 seconds and fade for announcer.

ANNOUNCER: Would you like to build big bombers for Uncle Sam? Would you like to learn welding, or aircraft mechanics, or aircraft sheet metal, or instrument making? Would you like to learn a trade that will place you in a defense industry . . . where you can help build the planes and munitions that will carry the war against the Axis? Then this is your program. This is a program designed to tell you what the Tulsa public schools are doing in their tremendous program of Vocational Defense Training. Each month, several hundred men and women complete training in this program and take jobs at Tulsa's bomber plant and other companies and industries where large-scale defense work is under way. In our studio today, we have a man and woman who have learned defense jobs and who are now working in Tulsa's Douglas plant. We have with us also Mr. R. B. McHenry, who is the man behind this defense training program. Mr. McHenry is the director. Mr. McHenry, will you introduce our guests?

MCHENRY: Yes indeed. We have here Mrs. Lois Louise Stewart and Mr. Bill Keyes, both former trainees of the school's defense training program, who are now working in Tulsa's Douglas plant.

ANNOUNCER: I see. Well, Mr. Keyes, I'm sure that people in our radio audience would be interested in knowing how you happened to enter this defense training, and how you later obtained this important defense job.

KEYES: I think so too. This training program is helping men and women to train for war industries jobs because the program is carried on under the supervision of the Tulsa public schools with leaders of the Douglas company advising. Trained instructors who know what kind of workers the government wants for its victory program are employed from Douglas and other companies.

ANNOUNCER: Will you tell us how you happened to enroll in this defense training, Mr. Keyes?

KEYES: You see, I was working for an automotive loan company last August when I decided that this defense training might mean a better job for me, and at the same time I could be doing my part for war production. I wanted to be an aircraft mechanic. So I made my application at the United States Employment Office at 125 West Third Street.

ANNOUNCER: I understand that all trainees must apply at the government employment office.

KEYES: That's right. After I applied for training, I was given aptitude tests by the United States Employment Office, to find out what type of work I could do best. Then I was referred to the Tulsa public schools' war industries training office, located at 2701 East 8th Street. I was interviewed again, and my test scores were studied by officials of the training program. In a few days, I was told to report to a class in aircraft mechanics.

ANNOUNCER: How long were you in training, Mr. Keyes?

KEYES: Ten weeks — 48 hours per week, or 480 hours.

ANNOUNCER: And then you went to work for Douglas?

KEYES: Yes.

ANNOUNCER: Can you tell us what type of work you are doing now?

KEYES: I'm sorry, sir, that's a "military secret," so to speak.

ANNOUNCER: I see. Mrs. Stewart, did you go through the same procedure to enroll for defense training?

STEWART: Yes, I did. Women also must apply for this training at the United States Employment Office. We are given tests

*Director, Industrial and Adult Education, Tulsa, Okla.

and recommended for classes the same way as the men.

ANNOUNCER: Isn't it rather unusual for a woman to be taking this training?

STEWART: No indeed! Of course, the Tulsa public schools only began training women last March, but the number is increasing all the time.

ANNOUNCER: Tell me, Mrs. Stewart, what do these women train for?

STEWART: We train for a number of trades and jobs. I work in production control at Douglas. The first women trained last spring, I understand, learned to be ordnance inspectors. Fifteen of that first group are working right here in Tulsa as inspectors. Then, some of the women train for such jobs as aircraft inspection, installation mechanics, bench machine work, acetylene welding, template making, drafting, aircraft sheet metal, riveting, and several others.

ANNOUNCER: I can see right now that I have underestimated the work of the fair sex in such important industries as the aircraft industry. Thank you very much, Mrs. Stewart, for giving us such an interesting picture of what women are doing in the war-production program.

MCHENRY: You might be interested to know, Mr. Hull, that we have found very little difference in the ability of men and the ability of women to learn these defense jobs . . . aside from the fact that most men naturally like to tinker with mechanical things, most of our women trainees learn as fast and as competently as the men.

ANNOUNCER: That certainly *is* interesting and encouraging. It will be well for us to know that our women can enter defense industries and carry on, although our best man power will probably be taken for military service altogether. Mr. McHenry, how many people has the schools' program trained since its beginning?

MCHENRY: Since beginning this defense training in July, 1940, our records show we have trained 10,525 people up to the present time.

ANNOUNCER: Were all of those people trained for new jobs . . . that is, jobs they had never held before?

MCHENRY: No. I believe 3050 of them were in the pre-employment group. They were the men and women who trained for new jobs, but who had shown through their tests that they were capable of learning those jobs. Several thousand of those trainees were in supplementary classes. That is, those men and women already were working on jobs as welders, aircraft sheet-metal workers, woodworkers, and in other jobs, but they enrolled in classes to upgrade themselves, and make an opportunity to advance into better jobs.

ANNOUNCER: How many people are the schools training right now?

MCHENRY: We have 2306 people in training now, and about one eighth of those are women. We have 134 classes in progress, with many of them running three shifts per day.

ANNOUNCER: Mr. McHenry, I've heard a great deal about the Tulsa public schools, but I have wondered if other school systems over the nation are duplicating this type of work.

MCHENRY: Yes indeed, they are. I believe other schools over the state are operating 188 classes of defense workers and the Sapulpa school system, under the direction of Mr. E. L. Southard, has inaugurated a training program for aircraft mechanics, enrolling around 100 men and women.

ANNOUNCER: I notice our time is growing short; but before we go, I'd like to ask Mr. Keyes another question. Mr. Keyes, can you tell us something about the way this defense training helped you in your new job?

KEYES: Yes, I can. This defense training gave me manipulative skill in the use of common tools. Besides learning the specialized work of an aircraft mechanic, I learned how to use drill motors, pneumatic screw drivers, riveting machines, nibblers, drill presses, and other equipment that figures so prominently in the aircraft industry.

ANNOUNCER: What sort of equipment did you work with in your training period?

KEYES: I discovered that the machines and equipment I used when I was being trained were very similar to those that I use on the job now. I understand that the schools have insisted on having the most up-to-date machines and equipment for this training program. If you've ever worked in an industry of this type, you know how important it is to learn the job on the same type of equipment you will use in actual working. Mr. McHenry has said, I believe, that more than $100,000 has gone into equipment for this training program.

ANNOUNCER: That certainly speaks well for the shops and classes where defense workers are being trained. Mr. McHenry, are you taking new trainees at present?

MCHENRY: Yes, sir! As the war grows in scope and proportions, and we throw more thousands of troops into the conflict, the more machines and munitions we need. It takes a constant stream of new trainees to learn to make those machines. Today, for example, we have several hundred individual men and women in classes; tomorrow we shall add around 180 new trainees. Next week we will need more men and women, and the following week we will need still more. I'd like to stress the fact, however, that all future trainees *must* apply for training at the United States Employment Office, 125 West Third Street in Tulsa. It takes 10 weeks to complete these courses; therefore, those who want to be prepared October 1 should enroll now.

ANNOUNCER: Aren't most trainees fairly certain of obtaining jobs when they finish their training?

MCHENRY: Yes, they are. There is a vital need for workers in aircraft, welding, and related jobs.

ANNOUNCER: Do you have a record of trainees who have found jobs after finishing this training?

MCHENRY: Yes, as far as our records show, approximately 1000 men and women have gone into defense industries, working in jobs for which they have trained. Of course, this number is conservative, because large numbers of trainees leave Tulsa, and perhaps go into these jobs in other cities. There is no way for us to keep a record on those trainees.

ANNOUNCER: I've been wondering who the people are who apply for this training. What sort of occupations have they been in before enrolling?

MCHENRY: Our trainees come from all lines of work. As we said a few minutes ago, Mr. Keyes was working for an automotive loan concern. Mrs. Stewart, I believe, was working as a housewife. Is that right, Mrs. Stewart?

MCHENRY: We have had salesmen, vacuum cleaner repairmen, auto mechanics, department store clerks, stenographers, beauty operators, switchboard operators, housewives, and weavers . . . all of them men and women seeking jobs in the all-important war industries.

ANNOUNCER: And will you tell us some of the jobs for which these people train? I'm sure there are prospective trainees in our audience who would like to know the type of jobs for which they might be trained.

MCHENRY: Yes, I have here a list of the types of classes we offer. I'll read off a few of them. In pre-employment classes, there are the following: arc welding, machine shop, aircraft engines, sheet-metal layout, welding, both aircraft and acetylene, bench machines, tracing, woodworking, aircraft inspection, aircraft sheet metal and assembly, installation mechanics. In the supplementary classes for people who are already working, but who want to improve on their jobs, we offer these classes: arc welding, welding technique, acetylene and aircraft welding, heavy plate layout, structural steel layout, machine shop, tool hardness and carbide tip tools, blueprint reading for machinists, aircraft engines, aircraft layout, aircraft blueprint reading, aircraft sheet metal, patternmaking, blueprint reading for pipe fitters, and instrument making.

ANNOUNCER: I would think that almost any person could select a future job from that list of defense jobs. Tell me, Mr. McHenry, are there any special qualifications for a worker in the aircraft industry . . . is there any special qualification you look for when you enroll trainees in these classes?

McHENRY: Yes indeed. Above all, we want to place trainees in the type of work they are best qualified to do. We want them to have an aptitude for their work, and we want them to be genuinely interested in their work. To women who want to train for these jobs, I would say this: Don't apply for training unless you are sincerely interested. Building bombers isn't a hobby or a lark. It's dead-serious wartime business.

ANNOUNCER: What about physical condition?

McHENRY: Naturally, we want people for training who are in the best possible physical condition. Physical handicaps or weaknesses don't help to speed production.

ANNOUNCER: I see. Mr. McHenry, you have given us a very comprehensive picture of this defense training program of the Tulsa public schools. Your contribution to America's victory program is a substantial one. We sincerely hope that the men and women you are training for the industrial front will help to bring victory sooner. Thank you, and we also thank Mr. Keyes and Mrs. Stewart, two Douglas Aircraft Company employees, for coming to our studio today. Good afternoon, and "Keep 'Em Training!"

BIZ (Sound of airplane warming up): Fade into music.

MUSIC: March used at beginning.

A Functional Related Course in the Graphic-Arts Curriculum

R. RANDOLPH KARCH*

The so-called "theory" or related subjects courses in vocational graphic-arts education are often not actually related. They are sometimes too general in content to do the graphic-arts student, as such, the maximum amount of good.

The teachers of the laboratory subjects in such courses as hand composition, presswork, photography, or machine composition usually believe that as much time as possible should be spent in *doing* to adequately cover the skills required. Seldom does the average laboratory instructor call his class to assembly to tell them about the things related to his subject — of the many machines not on the laboratory floor, of the many specialized jobs within the industry, of original and duplicate plates handled by students, of the special advantages of the various printing processes, of production problems, and of a great amount of other related information. The result is a narrow curriculum — a highly specialized course dependent not only upon the skills that the teacher possesses, but also upon the variety of equipment at hand.

Hand composition and platen presswork do not adequately cover enough ground to give proper education in the graphic-arts fields. A teacher of both of these subjects mentioned can correlate them reasonably well, but this represents only *two* occupations of probably 39 in the graphic arts. Hand composition and platen presswork are basic to several of these occupations, but not to *all* of them. More time should be allowed for related subjects which are *actually* related, because the laboratory teacher cannot present related information and at the same time do a good job of teaching required skills in his time allotment. The general science or English courses found in some schools do not usually cover the graphic-arts field.

*Principal, Printing High School, Cincinnati, Ohio, now on leave of absence with United States armed forces.

Believing that the laboratory subjects need supplementation to cover the fields of work in a functional curriculum, one graphic-arts high school has established a course called "Technical Studies," in which all laboratory courses are correlated, and in which enlightening discussions are held on all actually related subject matter. The course is now set up to cover three 48-week years, for five 45-minute periods per week.

A perusal of the following course outline and a study of the scope of the work at hand will show that there exists sufficient subject matter to require this time to cover the ground adequately. No time allotment is indicated on the outline; that is, one should not assume that each of the 61 major headings or the 133 minor headings should each be given like emphasis or are equal in curriculum time allotment. Some require days to cover — others merely hours.

TECHNICAL STUDIES 1, 2, AND 3 OUTLINE

Courses 18, 19, and 20

I. *Prerequisites:* The ability to gain knowledge about the graphic arts from textbooks and class discussions. The ability to read simple material and understand the content. The ability to sit and keep busy in tasks for one and one-half hour periods.

II. *Pretests:* Pretests are given as a matter of routine to determine any advanced knowledge on the part of the student. Mastery tests then show what has been learned in the course. Students who feel that they can satisfy the requirements, and therefore have the course waived, are allowed to take pretests to determine the extent of this knowledge.

III. *Objectives:*

1. To contribute to the attainment of the objectives of the work in the school as a whole, and to correlate with the following courses: hand composition, presswork, layout, estimating, health and accident hazards, machine composition, photography, lithography, and printers' mathematics.
2. To enable the student to make intelligent choice of one of the 25 occupations in the letterpress field, in the 11 occupations in the offset field, in the three occupations of the gravure field, or in the 16 occupations related to the graphic arts.
3. A study of the major occupations in letterpress and lithography: to gain necessary knowledge in regard to the work, educational requirements, physical requirements, promotional possibilities, and wages paid.
4. Advantages and disadvantages of work in the graphic arts.
5. Survey of the letterpress printing industry.
   - *a*) Type forms, their composition, make-up, and preparation.
   - *b*) Lockup, imposition.
   - *c*) Presses and presswork.
   - *d*) Manufacture and use of paper, plates, inks.
6. Survey of the offset-lithographic industry.
7. Survey of the gravure industry.
8. Survey of the supply field of the graphic arts.

IV. *Traits desirable for students:*

1. Mental alertness.
2. Constructive thinking.
3. Ability to discuss with others the ramifications of the graphic-arts industry.
4. Ability to work with others.
5. An earnest desire to learn graphic-arts work.
6. Good moral character.
7. Consideration for others.
8. Attitude of industry, cooperation, and self-reliance.
9. Readiness to assume responsibility.
10. Ability to take orders and to execute them willingly.

V. *Methods of teaching:* Several published works are used, with augmentation of class discussions:

1. *Printing and the Allied Trades.*
2. *Technical Problems of Production.*
3. *Job Composition and Commercial Display.*
4. *Type Metal Alloys.*
5. *Platen Presswork and Makeready.*

6. *Operation of the Ludlow Typograph.*
7. Other selected references.

VI *Duties of students:*

1. Keep accurate notebook and records of all work finished.
2. Proceed from one unit of instructions to the next without delay.
3. Take part in class discussions.
4. Make time reports on all units completed.
5. Spend all time to good advantage.

First and Second Year

1. The graphic-arts processes, sizes, and significance of each industry.
   - 1a) Letterpress.
   - 1b) Offset lithography.
   - 1c) Gravure.
   - 1d) Steel die and copperplate printing, intaglio.
   - 1e) Silk screen.
2. Departments of a letterpress plant, and duties of each.
3. Departments of an offset plant, and duties of each.
4. Departments of a gravure plant, and duties of each.
5. Occupations in the graphic-arts field, work, educational requirements, physical requirements, promotional possibilities, wages paid.
   - 1a) Letterpress printing.
     - 1a1) Hand compositor.
     - 1a2) Stoneman or imposition.
     - 1a3) Linotype-Intertype-Linograph operator.
     - 1a4) Ludlow operator.
     - 1a5) Linotype machinist.
     - 1a6) Platen pressman.
     - 1a7) Cutter.
     - 1a8) Cylinder pressman.
     - 1a9) Rotary pressman.
     - 1a10) Layout man or typographer.
     - 1a11) Proofreader.
     - 1a12) Copyholder.
     - 1a13) Printing salesman.
     - 1a14) Estimator.
     - 1a15) Pressfeeder, platen and cylinder.
     - 1a16) Foreman, composing room, pressroom, bindery.
     - 1a17) Plant superintendent.
     - 1a18) Binder.
     - 1a19) Pamphlet binder.
     - 1a20) Monotype keyboard operator.
     - 1a21) Monotype caster operator, including giant, material maker, type and rule, Elrod.
     - 1a22) Stereotyper.
     - 1a23) Make-up man.
     - 1a24) Printing engineer.
     - 1a25) Graphic-arts teacher.
   - 1b) Offset lithography.
     - 1b1) Pressman.
     - 1b2) Platemaker.
     - 1b3) Camera operator.
     - 1b4) Light table man.
     - 1b5) Cutter.
     - 1b6) Layout man.
     - 1b7) Salesman.
     - 1b8) Estimator.
     - 1b9) Foreman, camera room, plate room, pressroom.
     - 1b10) Plant superintendent.
     - 1b11) Pamphlet binder.
   - 1c) Gravure.
     - 1c1) Pressman.
     - 1c2) Platemaker.
     - 1c3) Cylinder etcher.
6. Advantages in working at publishing or printing.
7. Disadvantages of working at publishing or printing.
8. Related jobs in the graphic-arts industry, work, educational requirements, physical requirements, promotional possibilities, wages paid.
   - 8a) Photographer.
   - 8b) Electrotyper.
   - 8c) Photoengraver.
   - 8d) Rubber platemaker.
   - 8e) Personnel manager.
   - 8f) Advertising copywriter.
   - 8g) Publisher.
   - 8h) Editor.
   - 8i) Reporter.
   - 8j) Office manager.
   - 8k) Business manager.
   - 8l) Artist-cartoonist.
   - 8m) Advertising salesman.
   - 8n) Type founder.
   - 8o) Equipment and supply salesman.
   - 8p) Owner-operator.
9. Foundry type.
10. Kinds of type.
11. Point system.
12. How type is composed.
13. Spacing material.
14. Straight matter type composition.
15. Proving and correcting.
16. Distribution.
17. Borders.
18. Rule.
19. Display type composition.
20. Layouts and how to follow them.
21. Setting commercial composition.
    - 21a) Envelope corner cards.
    - 21b) Letterheads.
    - 21c) Business and social cards.
    - 21d) Billheads and statements.
    - 21e) Tickets.
    - 21f) Tags.
    - 21g) Labels.
    - 21h) Menus.
    - 21i) Programs.
    - 21j) Handbills.
    - 21k) Announcements.
    - 21l) Greeting cards.
    - 21m) Posters and window cards.
    - 21n) Advertisements.
    - 21o) Cover pages.
    - 21p) Book plates.
    - 21q) Rule forms.
22. Mechanical typecasting.
    - 22a) Advantages of mechanical typecasting.
    - 22b) Keyboard line-casting machines.
    - 22c) Ludlow typograph.
    - 22d) All-Purpose Linotype.
    - 22e) Teletypesetter.
    - 22f) Monotype system of type composition.
23. Lockup.
24. Imposition.
25. Presses for letterpress printing.
    - 25a) Platen presses.
    - 25b) Cylinder presses.
    - 25c) Rotary presses.
26. Make-ready.
    - 26a) Fundamental reasons for make-ready.
    - 26b) How make-ready is done.
27. Offset (setoff or smudging).
    - 27a) Nonoffset guns and how they work.
28. Pressfeeding.
29. Watching color when pressfeeding.
30. Setting up presses for work.
31. Printing plates, their advantages, how they are made, and how to order.
    - 31a) Photoengravings.
    - 31b) Stereotypes.
    - 31c) Electrotypes.
    - 31d) Wood engravings (rubber and linoleum blocks).
    - 31e) Wax engravings.
32. Ink.
    - 32a) Manufacture of inks, ingredients, use.
    - 32b) Kinds of inks for all processes.
33. Copper and steel plate engraving.
34. Thermography or raised letter printing.
35. Lithography, comparison with letterpress.
36. Gravure, comparison with other processes.
37. Paper.
    - 37a) Manufacture, ingredients, etc.
    - 37b) Kinds and use.
    - 37c) Classification of paper stock.
    - 37d) Figuring for cutting.
    - 37e) Cutting paper stock.
    - 37f) Testing in use.

Third Year

38. Preparation of printers' copy.
    - 38a) Publishing.
    - 38b) Commercial printing and lithography.
    - 38c) Newspaper.
39. Job ticket.
    - 39a) How to make out form.
    - 39b) How to make out instructions to departments: type, composition, presswork, bindery.
    - 39c) How to follow instructions of job tickets.
40. Layouts and their use in the graphic arts.
    - 40a) The preliminary layout.
    - 40b) The rough layout.
    - 40c) The comprehensive layout.
41. How to order supplies and outside purchases.
    - 41a) Paper stock.
    - 41b) Engravings and rubber plates.
    - 41c) Electrotypes.
    - 41d) Ink.
    - 41e) Bindery work.
42. Routing production.
    - 42a) Control methods in the graphic-arts process.
43. Composition room procedure.
    - 43a) Efficiency of workmen.
    - 43b) Efficiency of equipment and adequate supplies.
    - 43c) Advantages and disadvantages of:
      - 43c1) Hand composition.
      - 43c2) Linotype, Intertype, Linograph.
      - 43c3) Monotype cast material, the nondistribution system.
      - 43c4) Monotype caster forms.
      - 43c5) Ludlow Typograph and All-Purpose Linotype.
    - 43d) Time charges on all work.
      - 43d1) Chargeable time and its meaning.
      - 43d2) Nonchargeable time and its meaning.
44. Make-up and assembly of type matter.
45. Study of production charts for various machines.
46. Metal, its use and care.
47. Lockup and imposition.
48. Distribution and breakup of type forms.
49. Storage.

49a) Type and materials.
49b) Engraving and electros.
50. Layout of the composing room, pressroom, and bindery for efficiency.
51. Lighting.
52. Equipment.
53. Proofreading and proofing, with reproofing.
54. Premake-ready — the meaning of precision printing.
55. Make-ready.
56. Presswork.
57. Types of printing presses and their efficiency.
58. Difficulties encountered on the press.
58a) Workups.
58b) Wrinkles.
58c) Offset or setoff.
58d) Slurs.
58e) Register.
58f) Rollers.
58g) Running the job efficiently.
59. Bindery.
59a) Cutting machines.
59b) Folding.
59c) Drilling and punching.
59d) Perforating and other processes.
60. Paper.
60a) Humidity and its effect on paper while in storage and on the press.
60b) Figuring for cutting.
60c) Cutting paper.
61. Review of the duties of graphic-arts workers, their educational and physical requirements, promotional possibilities, and wages paid.

Social Education — A Process

W. J. JONES*

Boys are sent to the Pennsylvania Industrial School for training because they have failed to acquire good social attitudes and goals. Imposed upon the school, therefore, is the necessity of reconstructing individual personality toward making it socially adequate. Undesirable social attitudes and habits must be replaced by useful and socially acceptable conduct.

Human personality is far too varied and too complex, and the ways in which individuals are conditioned are too numerous to yield to a simple formula. Such techniques as "saying the right thing," "knocking it out of him," "making him do the right thing," are disclaimed.

The administration is definitely committed to the principle that better social outcomes for the boy are achieved by rewarding good conduct and excellence in training than by punishing sloth and error.

It is recognized that the whole process of training of the school affects character; and dependence is placed upon the process rather than in isolated instance or device. In this process it is essential that the staff know the individual boy fully and that the boy understand the aims of the administration. These are accomplished through individual interviews and orientation classes.

To learn to live well, one must have a good environment in which to develop. Instead of a rigidly controlled life there must be as complete freedom of choice as circumstances permit. Only by making choices intelligently and accepting responsibility for those decisions can personality develop self-dependence, self-respect, and cooperativeness.

Solitary life cannot produce the capacity to live socially. Frequent opportunity for group activity and for leadership practice must be available.

There is a place for discussion, for debate, for lectures, as in classrooms and assemblies, but only as supplement to participation in activities.

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Too much emphasis cannot be placed on the fact that socialization of the individual boy requires the impingement of well-adjusted personalities of teacher and custodial officer.

Personal Interviews

Each new boy during his initial thirty-day quarantine period is interviewed by various staff officers as part of a classification procedure. While the point of attack is the securing of such information as is necessary to understand the boy and his problems of adjustment, opportunities are naturally provided for the interviewer to interpret the boy's behavior to him, thereby increasing the boy's insight into his own difficulties and strengths. These interviews are conducted by the educational and vocational director, and his assistants (academic assistant, recreational director, and orientation officer), psychologists, social case workers, and chaplains (Protestants, Catholic, and Hebrew).

These staff officers are available for interviews throughout the boy's stay and are seen on the initiative of the orientation officer or of the boy.

Orientation

During the initial quarantine period, the boy attends a series of group meetings for the purpose of acquainting him with the school, its purposes, program, and regulations. These groups are conducted by the orientation officer on a discussion basis with question and answer periods. They are also addressed by the general superintendent or his assistant, and the educational and vocational director.

Stress is laid on the fact that the institution comprises a community in which the population lives, works, plays, and studies together. It is explained that, by proving his willingness to live well in this community, the boy demonstrates his ability to live again in free society.

The orientation officer, as part of the vocational guidance procedure, conducts groups of new boys through the shops explaining the work, processes, and tools of each occupation. He then interviews each boy once or oftener in assisting him toward making a suitable occupational choice for his training program.

General Education Classes

Knowledge of the right does not insure the doing of the right. To knowledge must be added emotional components. Emotional sets are derived from personal contacts, from a sense of belonging to and possessing loyalty to a group, to satisfaction of the need for recognition, and so forth.

Yet the individual must learn the proper way; the way approved by society in general. Here the presentation of sound social attitudes and practice in academic classroom finds its function. Not only the study of formal civic and legal procedures, but good manners, fair play, and give and take as well.

Essays in English and biographical sketches are obvious sources of social information and goals.

It is believed that well-written biographies provide stimulation to social living by a process sometimes called, "Identification."

The school library contains a good list of biographies. In academic classes, especially in courses in English, reading of biographies is encouraged and, at certain times, required. In the lower elementary levels, "Minute Biographies" and "More Minute Biographies" are supplied. On the upper elementary levels, "Living Through Biography" is required reading.

Effective social education will provide the boy with an understanding of the reasons for social organization, an appreciation of the individual's dependence upon social organization and of his responsibility to the group, not only for the welfare of the group, but for his own best interests as well. It will prepare him to accept the right of society to impose on him standards of behavior, and will awaken in him appreciation of the security and the privileges provided by an orderly society. There should eventuate the willing acceptance by the boy of economic responsibility for

himself and his family, met through useful employment.

Vocational Training

The administration of the school rejects the idea of work as punishment. Boys will work, but as training for work. The idea that boys can be coerced into developing "general habits of work" is also rejected. For a limited number, the work itself is sufficiently satisfying; but people, generally, work because they have extrinsic incentives. Work is a means of obtaining, legally, those things we need; a means of livelihood for ourselves and our loved ones. A few can appreciate larger or more remote goals — society's need for the product made or the service rendered, etc. The sense that society depends on one is a strong incentive when aroused.

The industrial school is especially fortunate in that the work on which boys are trained consists of real jobs. The upkeep of buildings and the construction of new ones, the manufacture of articles of many kinds for use in the school, producing farm products and the processing of them furnish the basis of the training in the building trades, metal and mechanical trades, personal service, manufacturing, and farm.

Participation in these practical activities is much more effective trade instruction than can possibly be obtained through shop "exercises." The transition from school shop to industrial situation is more easily effected. Furthermore the more mature the student the greater is the boredom from artificially created shopwork. That use will be made of the article provides a motivation impossible from an exercise that is to be scrapped when finished!

To the practical work out of which skills, co-ordination, and judgment are derived, must be added information. Trade theory is regularly taught at stated times in each shop during the workday. This comprises such items as the nature and sources of raw materials, their processing; shapes and dimensions of available trade materials; history of the occupation, its advantages and opportunities, its place in the industrial scheme; arithmetic computation; estimatings, etc.

While the length of stay of most boys in the school is too brief for them to become journeymen, many gain a status of advanced apprentice. A trade certificate is awarded, giving the boy a rating in terms of years of apprenticeship considered completed.

Teaching Patriotism

It is recognized that the personal difficulties of many delinquent boys began as rebellion against overly repressive manner of treatment in their early years. This rebellion was carried from the home to school and then to society in general. It is felt that new loyalties, out of which will come respect for authority, may be fostered by strengthening and encouraging those patriotic feelings common to most boys. Pride in America is fostered. One means is training in respect for the flag. National and state flags are raised each morning to the strains of the national anthem played by the school band. Every gathering of the population for entertainment is marked by the salute to the flag and the pledging of allegiance. Academic school classes similarly start by the salute and pledge.

It is fully recognized that this ritual may be a hollow round, but it is also maintained that the boys respond to the practice with willingness, enthusiasm, and soberness, indicating an emotional content of considerable strength.

Group Activities and Leadership Opportunities

Many boys are afforded the privilege of participating in various group activities for which high standards of behavior and accomplishment are prerequisites. Desire to enter these activities is in some measure motivating to that quality of performance in shop, school, playground, and ward, requisite to membership: Samples of such group activities are the color guard, band, ward committees, recreational council, and debating clubs.

In these group activities, leadership opportunities are provided for a few boys as presidents, chairmen, committee memberships, and the like.

Individual and Group Performance on Public Occasions

Opportunities are afforded boys, accomplished in music, drama, dancing, and public speaking, to perform before the population and, on public occasions, before gatherings of boys and visitors.

Debating Club

A debating club whose membership is limited and selective, guided by an employed coach, studies problems covering political, economic, social, and international issues.

Recreational Council

A group of representative boys selected from the various wards meet with the assistant superintendent, the educational and vocational director, and recreational director to plan and promote recreational activities, principally athletic. This is an excellent opportunity for each boy on the council to gain experience in leading the boys of his own ward in the organizing of teams, maintaining interest and morale, and in the sounding out of interest on the part of the boys in his ward and for their reactions to the program. He interprets to the council the sentiments of the boys in his ward, which are used by the council in revising procedures and the program.

Ward Committees

In several wards, committees have been formed and have served effectively in promoting activities within the ward, regulating behavior of less conforming individuals, determining recreational activities within the ward and advising the school administration on reactions of their groups on affairs within the ward.

Freedom of Choice

In all matters pertaining to the boy's individual program of training he is permitted a large degree of choice. He chooses the trade for which he will receive training with the proviso that his personal qualifications are suitable (physique, health, psychometric data, personality factors, opportunity for employment on parole, and custodial classification). He chooses to enroll or not to enroll in academic classes. He determines the manner of using his leisure time. Similarly, he may participate in recreational activities according to his desires. He is given some choice in selecting his cellmate when overpopulation necessitates doubling in cells.

Awards for Excellence

Many boys are singled out for special recognition in any of several ways; the basis for such recognition being: excellence in the development of work habits in the vocational shop, in work details, and in academic classes; for personal conduct and social living in the school; and for the maintenance of exceptionally clean individual living quarters. These awards may take any of the following forms:

Bonds of Honor are awards given to 20–25 per cent of the population on the basis of their general performance and on the proof they have furnished through a minimum period of four or five months duration that they are earnest in their training program and eligible to work under conditions of minimum security, outside the enclosure.

Good Conduct Cards are awarded to boys with excellent conduct records, but who can not qualify for a *Bond of Honor* because of security factors such as: previous escape from a correctional institution, lodging of a warrant for later appearance in court, and mental instability.

Special Commendations: Each Saturday evening before the school population two boys are publicly presented with a money award of $3 because of excellence in their training programs. The report covering shop and school performance is read to the population.

Time Awards are given certain boys on each *parent's day* (held semiannually) for outstanding performance in all aspects of school life and training. This is sometimes called, "The Outstanding Boy Award." The award is the shortening of

time by one to three months. (Parole date is advanced.)

Line Awards were undertaken as an alternative to the older method of punishing boys for breaking line; and for the past several years have had excellent results.

Shop Line Awards are given each week to the shop or detail line marching from ward to shop and back again, in the best form. Two days reduction in time is given every boy in the shop or detail winning this contest each week.

Ward Line Awards are of two kinds: The line voted the best as it moves from its ward to the auditorium for regular motion picture show, and returning, receives an extra entertainment during the following week.

The ward, having the best lines and order on all occasions during the month, is given a party in the main dining room. The party consists of entertainment, speeches by boys and officers, motion pictures and refreshments — ice cream and cake, candy, cigarettes and cigars.

Drill Squad Awards are of several kinds. Military drill is not required of boys in the industrial school, but a battalion is formed, on a voluntary basis, to be trained for exhibition drilling on parent's days. For this extra service the boys in the squads receive a time reduction of seven days.

Squads also have been organized from each ward and trained for competitive drilling, the judging being done by officers of the Pennsylvania National Guard. The winning squad is awarded time reductions.

Special Prizes, usually a cash credit to the boy's welfare account, are given on special occasions. Examples of these special prizes are the winning of an essay contest on "What Self Improvement Classes Have Meant to Me"; also the best idea presented by a boy as to how the sum of $200 can be used to benefit most of the population; the four or five finest articles entered in handicraft competitions, on parent's days, county and state fairs, and the like.

Preparole Instruction

The school parole officer and the director of social service each meet groups of boys ready for parole in a series of four meetings to give them instruction on parole regulations, on finding employment and general problems of readjusting to the home and community.

Religious Instruction

It is a part of the stated policy of the school that religion is a dynamic force in the stabilizing of boys, as well as being the basis of sound moral training; and that religion has its best opportunity with an individual when it is not forced upon him, but is strictly voluntary.

Full time Protestant and Roman Catholic chaplains are employed to provide the population with religious instruction and guidance. A rabbi visits the school to serve the Jewish boys.

Regular religious services are conducted. Much time of both chaplains is devoted to individual conferences with boys. Sound religious instruction cannot be divorced from social living. The impact of these workers is undoubtedly of great value in socializing the boys they reach.

Visits of Important Citizens

Visits to the industrial school by public officials and outstanding leaders in affairs in the state are encouraged by the school administration. Whenever possible, these men are presented to the school population and are asked to address the boys. When presenting such individuals, the superintendent informs the population of the visitor's achievements and contributions in his own particular field. During the past several years, these visitors have included the governor of the commonwealth, the secretary of welfare, other members of the governor's cabinet, many county court judges, church officials, businessmen, and leaders in the several professions.

Motion Pictures

Extensive use is made of motion pictures, both for instruction and for entertainment. Entertainment programs include, besides a feature picture, one or more shorts. These include travel, March of Time, historical and patriotic pictures.

Instructional films are used extensively in connection with courses in health and social studies and also in the teaching of trade theory in the vocational program.

The School Paper

The school paper, "The Record," a four-page newspaper, published weekly, is written almost wholly by student reporters. The editor is a student. The publication of the paper is supervised by the vocational printing instructor. Gathering the news and preparing the articles is done entirely by boys. "The Record" adopted as its governing principles: patriotism, education, trade training, and character building.

Editorials stress high standards of living. Most of these are written by the record staff; some are reprinted from other publications.

The paper reports the activity of the various shops, keeping all informed on especially important jobs being done. This recognition, in turn, tends to build a feeling of pride in their work in the boys studying a trade, and stimulates interest in their training.

It may be said that no one, nor any selected few of these items are effective social reconditioning in themselves. All operating together create a milieu in which the boy is surely reached. That the effect varies among the boys is not argued. That the cumulative effect of the total process, over 12 to 24 months, does affect social change in ever increasing numbers of our boys is the basis for our faith and hope.

RESPONSIBILITIES OF INDUSTRIAL ARTS IN THE PRESENT CRISIS

STEWART SCRIMSHAW*

Industrial arts has a proud history. It would be useless to speak of the "Responsibilities of Industrial Arts in the Present Crisis," if it were not evident that industrial arts had been a factor before the crisis. To this aspect, I wish to direct a few observations.

In order to appreciate the value of a responsibility in the present, it is well to examine some of the achievements of industrial arts in the yesterdays. Looking at it from the outsider's view — from one who sees the direct demands for the capabilities of youth — it can be observed that industrial arts has made the following contributions to the training of youth:

First, industrial arts has captured the imagination of school boys and stimulated their interest in all phases of industrial procedures.

Second, industrial arts has given an opportunity for youth to find a suitable form of expression, and an effective one, which is as old as humanity itself, i.e., expression through doing things.

Third, industrial-arts departments have not only taught young people how to do things, but they have taught the *right way* to do things. For example, when a person like myself thinks he knows how to sharpen the edge of a planer blade, he may be surprised to have a high school son promptly tell him that it is not being done the right way, and then to find that the student can show how it should be done. Incidents such as these tell their own story.

Fourth, industrial arts opens up avenues of interest and gives the boys an opportunity to know where and with what activity they may be likely to succeed. This can be verified by interrogating many a man who in the past entered into technical work involving drafting and tool designing in our modern manufacturing plants. The employer has had something to work on

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which was placed there, or rather developed by training in industrial arts.

Again, industrial arts gives orientation to motor-minded individuals, and also discovers boys and girls with aesthetic appreciation, thus developing a reservoir of youth with capabilities for profiting in very many practical and artistic occupations.

Finally, industrial arts has enhanced the appreciation for science and invention, which has a definite relation to most modern business and industrial activities, and which has become a genuine American characteristic.

In view of what has been enumerated, it is now fitting to ask, "What is the responsibility of industrial arts in the present crisis?" In answer to this inquiry, I would hasten to say, first of all, *continue the good work*. Inasmuch as industrial arts is organized as a basic educational institution, and is actually functioning, it is certainly sensible to suppose that it already does and can make valuable contributions in the war effort.

With reference to the immediate future, and for the direct war effort, I would suggest that in the present crisis efforts should be made to *introduce more young women to industrial arts*. It is obvious with the man power situation as it is, that many more girls will have to perform manifold jobs which are now done by men. Training in industrial-arts techniques will make it easier for them to take over these jobs.

Again, emphasis might be placed on the two different aspects of mechanical drawing. One aspect would be to develop young women capable of *mechanical drawing and detailing*. The other is to teach young women *blueprint reading*. There is scarcely any shop in any of the plants at the present time which does not involve the interpretation of blueprints. Further, the techniques and interpretation of dimensioning which characterizes drawing are important factors for which considerations women are peculiarly adapted, and for which the industrial-arts teachers are equipped to teach. Industrial-arts departments might stress the nature and *use of precision instruments*, teaching people how to read micrometers, vermier gauges, calipers, and the like.

Still another possibility of the industrial-arts departments is to offer an opportunity for women to learn how to use the *slide rule* and to teach them the fundamentals of *inspection work*, particularly in schools where there is a machine shop.

Some may ask, "How can industrial-arts departments be compensated for this special work?" First of all, the functions of industrial arts should go on as before, except for the change in emphasis and the probable inclusion of more girls in the classes. Outside of that, if it is possible to offer schedules for special groups out of industry or for special groups about to enter into industry, it can be offered as a war service. True, it is unlikely that industrial arts will be aided financially by direct government subsidies, for many industrial-arts teachers will not qualify under the war-training program because many of them have not themselves served an apprenticeship or learned a trade. It is too bad that this factor interferes with the part that can be played by industrial-arts teachers. However, there is still plenty of work to do. There is still a function to perform and the idea of every industrial-arts teacher should be to do what he *can* do; and not to try to do what he *cannot* do. You can't make all-round mechanics. You can, however, give basic training to machine operators, and one thing you can do better than some other people can do is to give the young people a good scientific background of training for industry. Today the greatest asset in industry among the oncoming employees is a background of scientific information of a practical nature that will enable potential employees to adapt themselves rapidly into new situations. There is hardly a job that does not involve some aspect of science.

The product of industrial-arts training should be a person with capabilities of adjustment; a person who has learned some short cuts; a person who knows enough mechanical experience to realize his limitations. That kind of a person, given opportunity in a factory, can proceed with clear comprehension. This I know to be true because I have observed such persons in some big plants where they have been trained on the job. These young men have profited and progressed because of their start in the industrial-arts departments of our high schools. If more of our young men and women had an appreciation and aptitude for the fundamental elements of our mechanical age, it would not only be an asset in personal development, but would enhance greatly the achievements of our whole industrial life, and be it said, is already a factor in our present production achievements.

The present crisis is one contingent upon the proper over-all development and use of our man power. Here industrial arts has its opportunity and its responsibility.

Industrial-arts teachers are not mere *job instructors;* they are educators, and as educators they are philosophers, and consequently must maintain the long-time point of view. It is for them to endeavor to equip all boys, and in many cases girls, to handle themselves properly in an industrial society. They can do the kind of a job that no one else can do. They can reach the boys and girls at the proper age, and give them what the psychologists call "conditioning" which will prove of value to the students whenever and wherever they may be called upon to meet the peculiar challenges which are a part of our scheme of life.

Many teachers of industrial arts seem to be laboring under some feeling of frustration, and that, I believe, is due to the fact that they are not permitted to see the evident results of their efforts. To be more specific, if a student of industrial arts has found a place in practical industry where he makes good, that fact gladdens the heart of the instructor, because the teacher knows that he had a part in the student's preparation. However, let us take another example of a student who had industrial-arts training, but instead of applying what he has learned in industry, he takes up the study of science. The effect of his industrial arts is not so obvious to the science teacher, but it is equally important. The student in research finds that he has to improvise different kinds of apparatus to carry on his experiments, and here his training in industrial arts stands him in good stead. I myself have had different opportunities to observe such experiences. I have asked such young men where they learned to use tools to such good advantage, and have been informed that they obtained this skill through their industrial-arts work in their elementary and secondary schools. There is another point in this connection, and that is, training in practical arts, even though the individual may not become very proficient, does a very important thing for such a person in helping him to maintain a better balance in his personal equation.

I believe very strongly that industrial teachers should "saw wood" until such time as the government sees fit to call individual teachers out of their vocations. We must think about tomorrow. The boys and girls in our schools comprise our tomorrow. The work of the industrial-arts teachers is so fundamental that I believe it would be a tragedy to have this work impaired by current opportunities engendered by mistaken ideas of what constitutes helping the war effort.

If, outside of regular class activities, industrial-arts departments can put on special classes for a war industry such as a course in "machine-shop inspection," "blueprint reading," or "drawing," well and good, but industry should ask for such a course, and preferably provide the trainees.

The total war effort, I believe, will be enhanced by industrial-arts teachers doing what they are equipped by tradition and present circumstances to do, and not by attempting to break into a field that they are not under present circumstances equipped to do. War industries are not asking or expecting our secondary schools to change a program which has been an industrial asset in times of peace. Obviously, if the functions of industrial-arts teaching was a vital educational necessity before the present crisis, it is no less so now. It is just as important for *basic training* now as ever. Teachers of industrial arts must keep their perspective, believe in their cause, and stay on the job. It is far easier to make ammunition than it is to make men.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

John J. Metz, Editor

Criticisms That Are Not Constructive

Not infrequently one hears industrial foremen complain bitterly that they have to spend so much time with men who have been trained to do some trade or part of a trade in the school shop, trying to superimpose proper methods on those acquired at school.

Some of these complaints, we will assume, are quite justified. Not all shop teachers may know the very latest methods employed in industry. That is equally true of experienced mechanics. If a worker has spent most of his time in a small industrial shop, where production work, as such, is an unknown quantity, he will have to change many of the methods commonly used at his old shop, before he can measure up to the best standards applied to workers in a thoroughly up-to-date plant.

If this is true about experienced workers, how much more would it be true of boys who have had from 2 to 15 hours per week for a semester in an elementary course in a school shop.

Again assuming that the foreman who is thus complaining about boys trained in school is really stating a fact and not merely advertising his own superior knowledge of industrial methods, would it not be a fine piece of civic service if he would visit the school shops and have a talk with the shop teacher. Probably, however, this shopman will have no time for making such a visit. In that case, he need but telephone to the teacher inviting him to the industrial shop, or even to an evening visit to the foreman's home where things can be talked over. He will find shop teachers very receptive to anything that may improve their work. He may also find that the man whom he has dubbed "that teacher at the school," may be a man who has a fine record of industrial shop experience, and not at all the incompetent person whom he has imagined.

The foreman should also know that in many cities there are committees of industrial workers and employers cooperating with the schools in establishing shop courses. If he is in a community where such a cooperating committee does not exist, he has a fine opportunity to suggest that one be established. The shop teachers, on the whole, are very anxious to do full justice to their work. But even if the one or the other should resent just criticism, no one must overlook the fact that the youth of America is entitled to the best type of education, and that employer and employee, business and industry — yes, every citizen of this country has a right and a duty to see that only the best is offered to the children who are being educated and trained in our schools.

Proper Shop Lighting

The need for conservation of many things has been quite forcibly brought to our attention since our country has gone into the war-production effort demanded by present conditions.

Probably few things that affect the individual should receive so much consideration as the conservation of his eyesight. That this is closely connected with the light under which the individual works or studies was brought out by a study made several years ago by the United States Public Health Service.

The objective of this study was to find out the relation of lighting to occupational efficiency. For the purpose of the study two New York City post offices were chosen. One was modern and well lighted, the other old and poorly lighted. A total of 2400 employees were studied. They were so chosen that they were comparable in their age distribution, nature of work, and years of service.

The study disclosed that the percentage of employees with normal vision in both eyes was twice as great in the modern building as those in the old. It was further found that 32 per cent of those working in the well-lighted office had defective vision in both eyes, 12 per cent had inflamed eyes, and 22 per cent had muscular unbalance of the eyes; while in the poorly lighted office, 42 per cent had defective vision in both eyes, 21 per cent had inflamed eyes, and 33 per cent had muscular unbalance.

Besides this, three times as many of the employees in the poorly lighted building complained of headaches traceable to the rapid fatigue of the eyes, as in the well-lighted post office.

The results of this study ought to be taken to heart by every school-shop teacher. Only too many school shops are improperly lighted. The conservation of the eyesight of the pupils working in these shops deserves a thorough study of how to improve the lighting system in at least the older shops.

For those teachers who want to study the subject of proper lighting more thoroughly, reference is made to the following articles which have proved helpful to others. They were published in past issues of this magazine:

"Hygiene of Vision in the School Drafting Room," by A. K. Rigast, p. 184, June, 1932; p. 213, July, 1932; and p. 239, August, 1932.

"The School-Shop Lighting Problem," by Walter Sturrock, p. 45, February, 1933.

"Securing the Right Kind of Light," by Elroy W. Bollinger, p. 135, March, 1933.

A Strange World

At the New York World's Fair in 1939, the world witnessed the solemn interment of the eight-hundred pound Cupaloy shell containing the ten-million word "Story of Civilization" which is to apprise the people living five thousand years hence how we of the twentieth century lived.

This Westinghouse time capsule was deposited in its specially prepared bed, fifty feet beneath the ground but four years ago. Future generations, who will unearth the "Story of Civilization" which it contains, may well wonder how a civilization so advanced in the arts, sciences, and engineering, could be so far behind in the science of conducting human relationships. They will wonder, no doubt, at the men who could take materials and fashion them into machines that would operate almost as if endowed with intelligence yet who could not live peacefully together so that they might enjoy the fruits of their inventiveness.

May the outcome of this gigantic upheaval bring about an era of peace in which man will have the leisure to discover the real reason of his sojourn on this earth.

Product Rating Scale for Shopwork

HARRY PAINE*

Element	0 — 69 F = 0 Failure Student	70 — 76 D = 1 Passing Student	77 — 84 C = 2 Average Student	85 — 92 B = 3 Good Student	93 — 100 A = 4 Excellent Student
1. Quantity of work (speed).	Always behind time requirements.	Sometimes meets time requirements.	At least meets time requirements.	Usually more than meets time requirements.	Always more than meets time requirements.
2. Quality of work (accuracy, precision finish).	Always below quality requirements	Sometimes below quality requirements.	At least meets quality requirements.	Usually better than quality requirements.	Always better than quality requirements.
3. Selection, use, and care of proper tools.	Continually misplaces or breaks tools. Incorrect selections.	Occasionally spoils a tool or makes poor selection.	Generally careful with tools. Selects fairly well.	Always careful. Sometimes repairs, replaces, or resharpens tools. Selects well.	Repairs, replaces, or resharpens tools. Selection excellent.
4. Selection, use, and care of proper materials and supplies.	Wasteful of materials and supplies. Incorrect selections.	Occasionally wasteful of materials or makes poor selection.	Generally careful with materials. Selects fairly well.	Always careful with materials and supplies. Selects well.	Conserves materials and gets others to do the same. Selection excellent.
5. Problem solving ability, analytical or systematic attack.	Solves no problems. No planning.	Solves only an occasional easy problem.	Solves those problems in which he is interested. Fair at planning.	Solves nearly all problems without help. Works systematically.	Solves all problems. Planning excellent.
6. Safe work habits and procedures.	Dangerous worker. Chance taker.	Sometimes careless. May take chances.	Usually careful. Seldom takes chances.	Careful worker. Takes very few chances.	Always careful. Protects others. Takes no chances.

Shop Morale and Attitudes

The products of the student should be graded on the elements outlined in the table accompanying this article. In addition, the instructor should call the student's attention to the following important elements of *shop morale and attitudes* and attempt to improve them. However, such elements should be kept separate from *product grading* which should depend on the six elements in the chart already mentioned. The important factors and traits in shop morale and attitudes referred to are the following: (1) promptness and punctuality; (2) cooperation; (3) effort and perseverance; (4) appearance and fit dress; (5) social attitudes; (6) apparent interest; (7) reliability; (8) initiative; (9) leadership; (10) honesty; (11) loyalty; (12) neatness and orderliness.

*Professor of Vocational Education, University of Cincinnati, Cincinnati, Ohio.

Class Morale and Attitudes

The class and laboratory work of the related and other subjects of the student

Rating Scale for Related and Other Subjects

Element	0 — 69 F = 0 Failure Student	70 — 76 D = 1 Passing Student	77 — 84 C = 2 Average Student	85 — 92 B = 3 Good Student	93 — 100 A = 4 Excellent Student
1. Preparation.	Fails to prepare.	Seldom prepares.	Usually prepares. Sometimes needs reminding.	Always prepared. Seldom needs urging.	Always well prepared without warning.
2. Homework (outside preparation).	Fails to turn in homework consistently.	Seldom completes homework.	Completes homework most of the time.	Always does assignments.	Always turns in high grade assignments, thorough work.
3. Participation in class discussion.	No participation.	Seldom participates.	Participates when called upon.	Responds readily, worth-while responses.	Volunteers contributions. Intelligent, thoughtful participation.
4. Industry (application to class assignment).	Wastes his time; bothers others.	Wastes time. Lazy.	Works without too much prodding — with supervision.	Works with little supervision. Consistent worker.	Always industrious. Completes his work — asks for more.
5. Method of attack on assignment (system).	No system.	Little logic in attack.	Usually a fair plan of attack.	Usually methodical and well-planned attack.	Analytical, logical plan.
6. Organization of contributions (end result).	Disorganized, slipshod work.	Poorly organized offerings.	Some planning and organization.	Usually well organized.	Always well organized — effectively presented.

should be graded on the elements outlined above. In addition, however, the instructor should call the student's attention to the following elements of shop morale and attitudes and attempt to improve them. However, such elements should be kept separate from production-grading which should depend on the six elements in the above chart. Important factors and traits in shop morale and attitudes appear below: (1) promptness and punctuality; (2) cooperation; (3) effort and perseverance; (4) appearance and fit dress; (5) social attitudes; (6) apparent interest; (7) reliability; (8) initiative; (9) leadership; (10) honesty; (11) loyalty; (12) neatness and orderliness.

Suggestive Method of Grading

Job or lesson unit grades:

Job or lesson unit grades should be recorded daily or at least three times per week for each subject taught. These grades may be based on a 100 point assignment positive percentage standard and may be translated to *positive* letter grades by use of the following chart. It should be kept in mind that these letter grades are not to be confused with letter grades arrived at by the comparative grading system.

93	to	100	points	receive an A
85	to	92	points	receive a B
77	to	84	points	receive a C
70	to	76	points	receive a D
0	to	69	points	receive an F

Letter grades may be averaged to determine the term grade. This is done by substituting numerical values for the letters, averaging the numerical values and relocating the nearest corresponding letter value. In this procedure A = 4, B = 3, C = 2, D = 1, F = 0. For application, see the following sample problem.

Sample problem: Assuming that the student received the following 14 letter grades, A, A, B, B, C, A, F, F, D, C, D, B, C, D, find a leter representing the average value.

Tabulate the grades as follows:

3 A = 3 × 4 = 12
3 B = 3 × 3 = 9
3 C = 3 × 2 = 6
3 D = 3 × 1 = 3
2 F = 2 × 0 = 0
Grand total .. 30

Letter determination:

$$\frac{30}{14} = 2\ 1/7 = C$$

Therefore, C = letter average.

Teaching Materials for Industrial Education

CHRIS. H. GRONEMAN

(*Continued from page 18, January, 1943, issue*)

Metalwork Division

Abrasive Co., Simonds Saw & Steel Co., Philadelphia, Pa.
Grinding Wheel Data Book
Safety Code for the Use, Care and Protection of Abrasive Wheels
General Purpose Grinding Wheels

Aluminum Company of America, Educational Dept., Pittsburgh, Pa.
An Outline of Aluminum
Aluminum Casting Alloys
Aluminum in Aircraft
Aluminum Paint Manual
Finishes for Aluminum
Forming Aluminum
Machining Aluminum
Riveting Aluminum
Welding Aluminum
The Working of Aluminum Alloys
Display Chart

American Can Co., 230 Park Ave., New York, N. Y.
Secondary Education in America (chart)
Help Make America Strong
Canned Foods Handbook

American Gas Furnace Co., Elizabeth, N. J.
Small Appliances Booklet No. 601

American Handicrafts Co., 193 William St., New York, N. Y.
General Catalog of Crafts Supplies — 10c
Instructions for Etching
Tool List for Cold Bent Wrought Iron
Tool List for Beaten Art Metal Work
Instructions for Finishes of Iron
Course of Study

American Rolling Mill Co., Middleton, Ohio
A Visit to Armco

American Type Founders, Elizabeth, N. J.
Handy Index of American Types
Education Through Printing (folder)
Why Teach Printing? (booklet)
A.T.F. Art Units (folder)

American Welding Society, 33 West 39th St., New York, N. Y.
Welding Symbols and Instructions For Their Use — 25c
Definitions of Welding Terms and Master Chart of Welding Processes
Code of Minimum Requirements for Instruction of Welding Operators, Part A — *Arc Welding of Steel* — 50c
Recommended Practices for Inspection of Fusion Welding — 40c
Engineering Essentials for Welders — 25c

Atlas Press Co., Kalamazoo, Mich.
Atlas Modern Shop Equipment General Catalog No. 41
Manual of Lathe Operation — 85c to teacher and students only; to others, $1
Wall Charts on Machine Shop Practice (set of 5) — 15c

Behr-Manning Co., Troy, N. Y.
A Lecture Course on Coated Abrasives (to teachers only)
Coated Abrasives for Finishing Metal (chart) (to teachers only)
Industry's Woodworking Abrasive Chart (to teachers only)
Supplement to the Lecture Course on Coated Abrasives (to teachers only)
Sandpaper — Its How and Why (to teachers and students)

Boice Crane Co., 932 W. Central Ave., Toledo, Ohio
1942 Catalog — Metal Spinning Book — 10c

Bradley Washfountain Co., 2269 N. Michigan St., Milwaukee, Wis.
Catalog 4010
Bradley on the Job

The Carborundum Co., Niagara Falls, N. Y.
Romance of Carborundum
Short Cuts to Better Work (free to teachers only; otherwise 10c)
Abrasives in the Service of Industry
Colored Wall Chart (free to teachers)

Carpenter Steel Co., Reading, Pa.
Tool Steel Simplified — $1 postpaid

Chicago Flexible Shaft Co., 5600 Roosevelt Road, Chicago, Ill.
Stewart Heat Range and SAE Steel Specifications (chart) (school department heads only)
Stewart Handbook of Heat Treating Information and Equipment
Stewart Vest Pocket Heat Treating Data Book
Stewart Metal Minutes (school department heads only)

Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio
The Use of Abrasives, G-465
Everyday Problems in Cutter Sharpening, M-981[a]
A Review of Grinding Theories, G-450
Milling Machine Practice, M-773-1[a]
Hydraulic Control and Feeding Mechanisms for Machine Tools, M-1001
Milling With High Speed Steel, M-1160[a]
Chip Formation, Friction and Finish, M-989[a]
Precision Cylindrical Grinding, G-397
Physics of Metal Cutting, M-825[a]
Machining With Single Point Tools, M-881

The Cincinnati Shaper Co., Cincinnati, Ohio
Cincinnati Press Brake Catalog B-1
Shapes for Sky Ships
Wings of Metal
Corrugating and Curving (poster)
Catalog on Shapers
Light Beam Shearing Gauge
Precision Shearing
Catalog on Shears
Bulletin on Power Rapid Traverse
Fundamental Principles of Press Brake Forming
Load Chart for Bending Metals
Armor Plate Shearing
Shaper Crank Diagram and Cross Section
Shaper Tool Chart
The Press Brake — A Versatile Tool

Clemson Brothers, Inc., Middletown, N. Y.
Metal Cutting With Hacksaw Blades — 10c

Clover Manufacturing Co., Norwalk, Conn.
Clover Catalog

[a]Free in limited quantities. In large quantities, 10c per copy.

Copper & Brass Research Association, 420 Lexington Ave., New York, N. Y.
History of Copper and Brass

The Delta Manufacturing Co., 600 East Vienna Ave., Milwaukee, Wis.
(The following booklets can be obtained for 25c)
Getting the Most Out of Your Lathe, Getting the Most Out of Your Drill Press, Getting the Most Out of Your Circular Saw and Jointer, Getting the Most Out of Your Shaper, Getting the Most Out of Your Abrasive Tools, Getting the Most Out of Your Band Saw and Scroll Saw, Furniture Designs; Novelties; 40 Fine Tables
(The following booklets can be obtained for 10c)
One Evening Projects; 21 Lovely Lamps; Garden Furniture and Novelties; Toys, Games, Playground Equipment; Project Book Nos. 2, 3, 4, 5, 6, 7, 8; Making Money With Delta Tools
Practical Finishing Methods — 50c
19 Charming Chairs — 15c
Small Furniture Designs — 20c
The Deltagram — 50c per year (6 issues, October to March)

William Dixon, Inc., 32 E. Kinney St., Newark, N. J.
Fig. 69 *Simple Projects in Art Metal and Jewelry* — 25c
Fig. 63 *Operations and Processes for Metal Crafts* — 25c
Fig. 1 *The Dixon Manual for Metal Artists* — $1.50
Fig. 1A *Designs for Piercing, Chasing and Etching* — $1.50
Fig. 65 *Manual for Artisans in Wood and Metal* — $1.50
Fig. C1 *Projects in Art Metal, Jewelry and Iron* — 80c
Set of 6 publications, $4
Fig. 70 *Designs and Instructions in Art Metal Crafts for Teachers and Students* — $1.75

Dumore Co., Racine, Wis.
Drill and Tap Chart
The Care and Operation of Portable Precision Lathe Grinders — 25c

Fellows Gear Shaper Co., Springfield, Vt.
Operator's Handbook — 30c
The Involute Gear — 18c
The Internal Gear — 26c
The 6-A Type Gear Shaper — 20c
The 7-Type High Speed — 30c
(The above mentioned literature may be obtained free in quantities of less than 25. For larger quantities the prices mentioned after each title will be charged per book)

Foley Manufacturing Co., 9–11 Main St., N.E., Minneapolis, Minn.
New Teeth in Three Minutes for Hand Saws
Foley Automatic Saw Filer

Fosdick Machine Tool Co., Cincinnati, Ohio
Jig Borer
Horse Power Required for Drilling Machinery Steel
High Speed Drills
Hydraulic Radials

Gallmeyer & Livingston Co., Grand Rapids, Mich.
Grand Rapids Heavy Duty Surface Grinder
Universal Cutters and Grinders

Greenfield Tap and Die Corp., Greenfield, Mass.
Facts About Taps and Tapping
How to Get More Production From Taps

Handy & Harman Co., 82 Fulton St., New York, N. Y.
Sil-Fos and Easy-Flo for Speed, Strength, Economy — Bulletin No. 12

Hobart Brothers Co., Troy, Ohio
Lessons Book — 75c
Practical Arc Welding Manual and Training Course — $2

International Acetylene Association, 30 E. 42nd St., New York, N. Y.
Training Oxy-Acetylene Welding and Cutting Operators — 25c
Oxy-Acetylene Cutting — 25c
Oxy-Acetylene Welding and Its Applications — 25c
Miscellaneous Uses of the Oxy-Acetylene and Air-Acetylene Flames — 15c
Welding Codes and Specifications — 15c
Sample Pipe Welding Specifications — 10c
Tests for the Selection of Welding Operators — 20c
Bronze Welding or Brazing of Iron and Steel by the Oxy-Acetylene Process — 20c
The Effect of Flame Cutting on Steel — 25c
Hard-Facing by the Oxy-Acetylene Process — 25c
Safe Practices for Installation and Operation of Oxy-Acetylene Welding and Cutting Equipment — 25c
Flame Hardening by the Oxy-Acetylene Process — 20c
Training Oxy-Acetylene Welding and Cutting Operators — Instructor's Outlines — Including Outline Course for Inspectors — 25c; De Luxe Edition — 75c

Joseph Weidenhoff, Inc., 4340 W. Roosevelt Road, Chicago, Ill.
Distri-U-Scope

Kearney & Trecker Co., Milwaukee, Wis.
Bulletin No. 725
Special Literature

Kester Solder Co., 4201 Wrightwood Ave., Chicago, Ill.
Kester Fluxes[4]
Kester Acid-Filled and Plastic Rosin-Filled[4]
Facts on Soldering
Rosin-Filler Solders[4]
Solder With Economy
Bar Solder[4]
Corrosion in Soldering
Soldering Tips
Aluminum Solder[4]
How to Use Flux Fill Solders

Kewanee Boiler Corporation, Kewanee, Ill.
Boilers (and their products), Boilers, Heaters, Tanks
Scale (for reading) Pipe Sizes

Kleenex Projects Service, Dept. 1A–3–919 North Michigan Ave., Chicago, Ill.
Portfolio No. 1 for Elementary Levels
Portfolio No. 2 for Secondary Levels

Koebel Diamond Tool Co., 9353 Grinnell, Detroit, Mich.
For Grinder Men Only

R. K. LeBlond Machine Tool Co., Cincinnati, Ohio
Running a Regal — 25c each when ordering less than 100; on larger orders — 20c each
Wall Chart of Regal Lathe (free to instructors)
March of the Master (free to instructors)

Lewis Machine Tool Co., P.O. Box 116, Sta. A., Dept. X–16, Los Angeles, Calif.
Build Your Own Machine Tools

Lincoln Electric Co., Educational Dept., Cleveland, Ohio
Procedure Handbook of Arc Welding Design and Practice —$1.50
Lessons in Arc Welding — 50c
Simple Blueprint Reading — 50c
Arc Welding in Design Manufacturing — $1.50
Welding Metallurgy — $1.50

Lyon Metal Products, Inc., Aurora, Ill.
Lyon Shop and Equipment Catalog

Metropolitan Life Insurance Co., New York, N. Y.
Industrial Safety Education in Schools (single copy free to teachers)
First Aid

Metal Crafts Publishing Co., Providence, R. I.
Books on Metal Crafts
Metal Crafts Equipment and Supplies (catalog of the metal crafts, a brochure on metal crafts problems, and items of interest) — 50c per year, 3 issues

Metal & Thermit Corp., 120 Broadway, New York, N. Y.
Thermit Welding[5]
Murex Welding and Electrode Information Booklet[5]

National Tube Co., P.O. Box 266, Pittsburgh, Pa.
Correct Pipe Treading Principles (20-page illustrated bulletin)

Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
No. 200 *Reference Booklet*
No. 103–C *Vocational Bulletin*
Helps for Sheet Metal Men (wall chart)

Nicholson File Co., Providence, R. I.
A File for Every Purpose
Price List of Files and Rasps
Price List of Swiss Patterns
Hints on Files and Filing
Marks of a Good/Poor Mechanic
More About Saw Filing
King Saul Knew About Files
Swiss Pattern Files
Working on Brass
Long Angle Lathe File
For Rough Touch Work
(Above literature free to teachers)

Norton Co., Worcester, Mass.
Grits and Grinds (monthly publication); *Handbook for Grinding Apprentices;* Norton Lecture Course (to instructors only)

Oliver Machinery Co., Grand Rapids, Mich.
Installation, Care, and Operation of Oliver Circular-Saw Benches
How to Get More From Your Band Saw
Installation and Operation of Band Saws

Peck, Stow, and Wilcox Co., Southington, Conn.
Sheet Metal Bulletin SB–35

Power King Tool Corp., 313 Cleveland St., Warsaw, Ind.
Catalog-Power King

Sargent and Co., P.O. Box 1940, New Haven, Conn.
Standard Steel Squares
Sargent Planes
Auto-Set Bench Planes (chart)

Skilsaw, Inc., 50–35A Elston Ave., Chicago, Ill.
Tools for Defense of America, Catalog No. 43
One and Two-Hand Operations With Skilsaw

SKF Industries, Inc., Front St. & Erie Ave., Philadelphia, Pa.
SKF Transmission Appliances
SKF Conversion Tables
SKF Data Sheets
How Are Balls Made Round?

The Skinner Chuck Co., New Britain, Conn.
War-Time Bulletin covering Hand Operated Chucks
Skinner Chucks — Bulletin 54

Smooth-On Mfg. Co., 570 Communipaw Ave., Jersey City, N. J.
Smooth-On Handbook

South Bend Lathe Works, South Bend, Ind.
How to Run a Lathe (book) — 25c
How to Cut Screw Threads No. 36A — 10c
How to Ground Cutter Bits No. 35 — 10c
Measuring With Inside Calipers (chart) No. 591 — 10c
South Bend Lathes (catalog)
Decimal Fractions (chart) — 10c
How to Become a Machinist (chart) — 10c

Stanley Tools, New Britain, Conn.
Expert Soldering
The Steel Square
Stanley Tool Catalog
Joy of Accomplishment Booklet

L. S. Starrett Co., Athol, Mass.
Starrett Book for Student Machinists — 75c

Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, Ill.
Amateur Radio — 75c
Transmitter Guide, 15c list price
Amplifier Guide — 15c list price
Transformer Manual (including above guides) — 35c list price

U. S. Printing Office, Superintendent of Documents, Washington, D. C.

[4]No samples available; literature gratis.

[5]Free in small quantities.

Simple Plumbing Repairs Bulletin — 5c
Farm Plumbing — 5c
University of Nebraska, Cooperative Extension Dept., Lincoln, Neb.
Series of 40 Forging Exercises — each 5c
Walker-Turner Co., Inc., 1932 Berckman St., Plainfield, N. J.
Walker-Turner Machine Tools
The Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, Ohio
Know Your Turret Lathe
Instructions for Grinding and Setting Cutters
Cutter Grinding Gauge
Speed Chart for Turret Lathes
Turret Lathe Tools
J. H. Williams Co., Buffalo, N. Y.
How to Select and Use Wrenches, Form No. A–445
Machinists' Tools, Form No. A–431
"Supersocket" Wrenches and Tools, Form No. A–409
Improved Carbon Steel Wrenches, Form No. A–81

(To be continued)

102 Key Words

F. THEODORE STRUCK*

Every teacher has occasion to use key words in formulating oral as well as written questions, in making assignments, and in preparing tests or examinations.

As an aid to such responsibilities, there follows a list of 102 key words that may be helpful. The words were selected by checking written questions, assignments, and problems found in a dozen textbooks in the fields of practical arts and vocational education. The list could be extended — and needs to be, in certain areas of learning. The words have been arranged in alphabetical order for the sake of convenience. The words may be used singly as key words in sentences or they may be combined as, for example, "tell how," "suggest where," "show why."

When a student, in oral discussion, gives evidence of vagueness of thinking, he may be forced to think realistically by saying: "Cite an example," or "for example."

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Many of the words that follow contribute toward conciseness which is of special value in the "new type" objective tests which are gaining favor.

It is suggested that teachers may find it helpful to have the list available for reference purposes especially when written questions and assignments for test items are being prepared. In some instances any one of several key words could be used. A certain amount of variety may be obtained through selection. Through repeatedly using key words not commonly used before, we expand our professional vocabulary. Here is the list.

affirm
analyze
apply
appraise
arrange
assemble
assess
assume
catalog
check
cite
clarify
classify
comment
compare
consider
construct
correlate
criticize
debate
defend
define
demonstrate
describe
determine
develop
devise
diagnose
differentiate
discriminate
discuss
distinguish
do
draft
draw
elaborate
enumerate
evaluate
examine
explain
express
find
form
formulate
give
group
how
illustrate
indicate
integrate
interpret
inquire
investigate
justify
list
make
mention
name
outline
perform
plan
prepare
present
propose
rank
rate
read
recall
recapitulate
record
report
restate
review
scrutinize
secure
select
show
signify
solve
state
study
submit
suggest
summarize
supplement
suppose
tabulate
take
tell
test
try
use
validate
visit
weigh
what
when
where
which
why
work
write

The Positive Approach to Good Control

J. I. SOWERS*

Discipline is not one of the worries of the well-trained teacher under normal conditions. The fault for disciplinary troubles lies more often with the teacher than with the students. A change of a good teacher for a poor one makes a change from a poorly disciplined group to a good one in practically every instance. The troubles usually are due to the fact that a teacher tries to enforce good control by negative methods of policing, rather than the use of methods of positive control. It is the object of the following outline to give some suggestions for the positive approach.

A. *Build Up Right Attitudes*

1. Make first contact and all relations with students frank and friendly.
2. Show enthusiasm and good understanding of the work. Ask for, and give attention to, students' suggestions and ideas.
3. When possible and not too time consuming, help students locate sources for solving their problems and working out their difficulties.
4. Make explanations brief. Confine yourself directly to the matter in hand; avoid prolixity.
5. Be competent and workmanlike yourself and require a workmanlike attitude on the part of the student.

B. *Create Interest*

1. Satisfy the impulse to do constructive work as soon as feasible.
2. Within limitations students should be encouraged to work out their own ideas after the working plan has been developed and approved by the instructor. Guard against failure in this.
3. Introduce questions and suggestions which stimulate interest and arouse curiosity.
4. Keep *problems* before the students. Your students learn by giving thought to things, not by following formula explained in answer to constant questioning of teacher. See that some new approach or new problem is encountered in every project.

C. *Stimulate Initiative*

1. Commend students occasionally for doing a nice piece of work, or for being thoughtful in their approach to a problem.
2. Motivate the work by use of material exhibits, calling attention to work being done in or near the school, visits to factories, and the like.

*Director of Industrial Arts, Miami, Fla.

3. Allow competition to develop in some of the work.
4. The teacher can make skillful use of a method whereby he allows the student to plan, evaluate, or grade his own work. Also, the student could pass judgment on his conduct in the light of all others doing the same thing.

D. *Maintain a Workmanlike Business Atmosphere*

1. Insist upon relatively high standards of work.
2. Encourage respect for other students and for all tools and materials.
3. Allow freedom of consultation with other students but not to the extent of breaking down shop discipline or control.
4. The teacher should wear some type of working insignia, i.e., working clothes and apron or in the drafting room a smock or whatever is commonly worn by local craftsmen. The teacher should stay in the laboratory or drafting room where he can be consulted.
5. Instead of making rules, encourage the students to make their own code for proper conduct when difficulty arises.
6. The teacher will have to organize his shop for efficient work; this will mean shop organization but he should avoid making *rules* as such. *Keep off the grass* arouses our resentment, but the one word *please* keeps everybody on the walks in the parks of a great city. Make good conduct suggestive and expressive of individual merit rather than demanding obedience.

Finally, let it be known that your primary purpose is to work with the class for their advantage. They are not working for you, and in turn you are not working for them in the sense of solving all their minor difficulties. They will soon sense that you are what you were meant to be — a teacher, and not a policeman, handyman, or Simon Legree.

Testing and Tests

A Study of a Test for Shop Teachers to Show Professional Growth

GORDON O. WILBER*

"A Test for the Shop Teacher," which appeared on page 321 of the November, 1935, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, impressed the writer with the possibilities of using this or a similar test to determine the professional growth of students who were preparing for industrial-arts teaching.

Accordingly, the test as printed was given to approximately 350 freshmen and sophomores. The test was again given to 33 of the same men during their senior years. In order to simplify the study, 120 papers were chosen at random to represent the undergraduate group in this study. All 33 of the senior papers were used.

If such a study is to be of value, it cannot be purely a matter of comparing scores. Rather it must, to some extent, point out the weaknesses of the incoming students and also of the graduates. To promote this end, the questions proposed on the test were divided into several groups according to the type of information required. Five main categories were finally decided upon as follows: historical professional, contemporary professional, technical, books and authors, and supplies and equipment sources. The selections for the various divisions were made empirically and there is undoubtedly room for question in the placing of many. For purposes of the study, however, the 200 questions were divided as follows:

	Number	*Per Cent*
Historical professional	14	7
Contemporary professional	78	39
Technical	75	37.5
Books and authors	28	14
Supplies and equipment	5	2.5

The following table shows the results of the test as taken by 33 senior students and 120 freshmen and sophomores:

	Freshmen and Sophomores (120)			*Seniors (33)*		
Type of Questions	*No. of Questions*	*No. Correctly Answered*	*Per Cent*	*No. of Questions*	*No. Correctly Answered*	*Per Cent*
Historical professional	1,680	373	22.2	462	190	41.1
Contemporary professional	9,360	568	6	2,684	539	20
Technical	9,000	3,312	36	2,475	1,698	68.5
Books and authors	3,360	265	7.9	924	274	29.6
Supplies and equipment	600	105	17.5	165	59	35.7

An analysis of these data would seem to indicate that the students who enter the industrial-arts teacher education course at Oswego are fairly well informed along technical lines. This is probably due to the strong industrial-arts departments in many New York State high schools. A considerable knowledge of supply and equipment source may, no doubt, be traceable to experience with industrial materials gained in the same manner. As would be expected, the beginning students proved weakest in those knowledges relating to contemporary professional matters, such as the ability to identify leaders with their various schools or offices. They also seemed to have but little knowledge of important books and authors relating to industrial arts. It is interesting to note that while the seniors showed the greatest amount of improvement in these two categories, they still remained the weakest points in the students' preparation. It is undoubtedly true that a great part of our information of a contemporary professional nature comes as the result of reading and from contacts at meetings, conventions, etc. The lack of opportunities afforded students in training to attend such functions probably accounts in part for their seeming lack

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of this kind of information. A more consistent use of current professional magazines in various classes might show results in improvement along these lines.

One of the most interesting results of this study has been the information obtained concerning the improvement shown between the first and second times that the test was taken. A careful check was made with the result that gains of from 8 to 66 questions were found. The mean score for all freshmen and sophomores was found to be 40 items correctly answered, while that for seniors was 84. This decided improvement of an average of 44 questions, while not as high as might be desired, is still very significant. Especially interesting is the persisting superiority (68.5 per cent correct) which is maintained along technical lines.

A study of this type also provides opportunity for comparing the product of a given school with that of the country at large. The author of the test used found, for example, that when the test was given to 34 experienced industrial-arts teachers from various parts of the United States the mean score was 78 items correctly answered. For teachers having less than five years of experience the mean was 71 items right. If several of the teacher education departments over the country were to use this or a similar test during their senior years, the comparative equipment of graduating students as concerns this type of information might be established.

ORTHOGRAPHIC PROJECTION TEST

HARRY F. MERGELER
West Technical High School
Cleveland, Ohio

Part I. Theory

Directions: Read each statement carefully. Think of the term that will complete the statement. Find this term in the right-hand column, and write the number of the term in the parenthesis.

Description and Statements	*Answers*
( ) 1. The top view is projected on the	1. dash
( ) 2. The side view is projected on the	2. dimension
( ) 3. The front view is projected on the	3. extension
	4. foreshortened
( ) 4. The front elevation is projected on the	5. front view
	6. horizontal plane
( ) 5. The side elevation is projected on the	7. inclined
	8. intersection
( ) 6. The plan view is projected on the	9. invisible
( ) 7. The vertical projection is projected on the	10. lengthened
	11. line
( ) 8. The horizontal projection is projected on the	12. oblique
	13. orthographic projection
( ) 9. The profile projection is projected on the	14. profile plane
	15. picture plane
( ) 10. The perspective is projected on the	16. point
	17. plan
( ) 11. Projecting from the object to the plane the exact shape of the object is called	18. perspective drawing
	19. parallel
	20. side
( ) 12. A surface or line parallel to a plane of projection will be shown in its	21. two
	22. true length
	23. true shape
( ) 13. A surface perpendicular to a plane of projection is projected as a	24. top
	25. three
	26. vertical plane
( ) 14. An inclined line will have a projection shorter than its	27. vertical projection
( ) 15. A line perpendicular to a plane of projection will be projected as a	
( ) 16. A surface or line inclined to a plane of projection is	
( ) 17. Which view shows length and width	
( ) 18. Which views have the same height	
( ) 19. Which views have the same width	
( ) 20. Which views have the same length	

Part II. Vocabulary

Directions: Read each description or definition in the left-hand column. Then select the word thus described in the right-hand column, and write its number in the parenthesis.

Description and Definitions	*Answers*
( ) 1. A line level with the horizon is	1. axis
( ) 2. A line parallel to a plumb line is	2. axle
( ) 3. Two lines forming a right angle are said to be	3. angle
	4. auxiliary
( ) 4. Two lines that keep the same distance apart and extend in the same direction are said to be	5. auxiliary plane
	6. blocking in
	7. converge
( ) 5. A line which is neither vertical nor horizontal is said to be	8. cutting plane
	9. detail dimension
( ) 6. An imaginary surface to which views are projected	10. dimension
	11. extension
( ) 7. The side view is also called	12. foreshortened
( ) 8. A picture of an object is sometimes called a	13. full section
	14. gothic
( ) 9. Drawing lines at right angles to a plane of projection is called	15. horizontal
	16. half section
( ) 10. Drawing all horizontal and vertical lines and proceeding from these is called	17. invisible
	18. inclined
	19. intersect
( ) 11. Turning about a central point	20. orthographic projection
( ) 12. The imaginary center of an object	21. over-all
	22. perpendicular
( ) 13. Inclined lines projected to a surface are shown	23. parallel
	24. plane
( ) 14. Lines which cross are said to	25. profile
( ) 15. The opening formed by the intersection of two lines	26. perspective
	27. ruling out
( ) 16. Rays of light which meet at a central point are said to	28. revolving
	29. size dimension
( ) 17. Lines which represent edges we can see are called	30. vertex
	31. visible
( ) 18. Lines which represent edges we cannot see are called	32. vertical
( ) 19. Dimensions which give the size for each part are called	
( ) 20. Dimensions which give the principal sizes are called	

EVERY PUPIL SCHOLARSHIP TEST

ROBERT P. JENSEN
Industrial Arts-General Shop
Teachers College
Emporia, Kans.

Directions: Read the directions for each part and follow them. Answer easy items first; return to others later. You will have exactly 40 minutes.

Part I

Directions: Read the following sentences carefully. If a statement is true, place a plus (+) in the parenthesis before the statement, as in example A. If the statement is false, make a minus (—) in the parenthesis, as in example B.

Examples: (+) A. America was discovered by Columbus.
(—) B. The first president of the United States was Lincoln.

( ) 1. Basswood has suitable qualities for drawing boards.
( ) 2. The head of the T square should be placed along the top edge of the drawing board.
( ) 3. The number stamped on an auger bit indicates its size in tenths of an inch.
( ) 4. Both the gimlet bit and auger bit have a screw or spur point.
( ) 5. With a ratchet bit stock it is possible to bore holes close to a wall.
( ) 6. The letters r.h.b. refer to a type of nail used in finishing.
( ) 7. Mill marks on the surface of lumber are a result of planing with the plane blade set too deeply.
( ) 8. Animal glue is put to soak in hot water.
( ) 9. The Underwriter's knot is used in wiring a lamp socket.

( ) 10. Chromium steel is one form of stainless steel.
( ) 11. The beakhorn stake in sheet-metal work is used to make right angle bends in wire.
( ) 12. The bar folder in metalwork is used to bend mild steel bar stock.
( ) 13. Two dry cells in series have a total voltage of three volts.
( ) 14. A die is used to cut inside threads.
( ) 15. The chief use of aluminum is in transportation.
( ) 16. A bevel cut extends down through the full thickness of the board.
( ) 17. Cast iron contains from 3 to 5 per cent of carbon.
( ) 18. A hexagon has six sides.
( ) 19. An arc is always one half a circle.
( ) 20. An equilateral triangle has four sides which are equal.
( ) 21. Continual reheating of animal glue makes its holding qualities better.
( ) 22. In squaring up stock the T bevel is used to test for squareness.
( ) 23. The correct procedure in inking horizontal lines is to start at the bottom of the drawing.
( ) 24. Pastewood filler is used in finishing close-grained woods.
( ) 25. The dividers are used in mechanical drawing to draw circles and arcs.
( ) 26. The average person can better understand an isometric drawing than an orthographic drawing.
( ) 27. In mechanical drawing, dimension lines touch extension lines.
( ) 28. The cutting edge of a wood chisel is beveled on one side only.
( ) 29. The burnisher is used to turn the burr on a cabinet scraper.
( ) 30. Walnut is an open-grained wood.
( ) 31. The point of the tooth on the ripsaw has the same shape as the point of the tooth on the crosscut saw.
( ) 32. The backsaw is used to saw curves in thin wood.
( ) 33. The term S2S refers to a type of wood screw.
( ) 34. The term FAS refers to the two highest grades of hardwood lumber.
( ) 35. A maple floor has a more beautiful grain and figure than an oak floor.
( ) 36. Muriatic acid is used to etch copper.
( ) 37. The most commonly used plywood is made of pine.
( ) 38. An architectural drawing is used to show intricate details of machine parts.
( ) 39. The four edges of a book are called the head, tail, back, and fore edge.
( ) 40. The part of the motor upon which the brushes make contact is called the field.
( ) 41. Maple is a close-grained wood.
( ) 42. Gumwood is used to imitate walnut in the cheaper grades of furniture.
( ) 43. Books are frequently bound in a cover cloth called super.
( ) 44. Nickel silver contains some silver to give it a bright luster.
( ) 45. The term bisquit refers to the first firing in ceramics.
( ) 46. Annealing and tempering of metals refer to the same heat-treatment.
( ) 47. A hack saw is used to cut 28-gauge metal.
( ) 48. The common 50–50 solder is composed of one-half lead and one-half zinc.
( ) 49. Hydrochloric and muriatic acid are two different terms for the same acid.
( ) 50. The glaze on pottery is applied just before the article is put into the kiln for the first time.
( ) 51. Taps and dies in a set are called screw plates.
( ) 52. In a perspective drawing, lines which are parallel on the object are shown parallel on the drawing.
( ) 53. A rabbet cut runs lengthwise with the grain of the board.
( ) 54. A miter joint as in a picture frame is made by a 45-deg. cut.
( ) 55. Our standard house lighting circuit is 100 volts.
( ) 56. The symbol (3′ 11″) represents 43 inches.
( ) 57. A common form of modern plastic material is made from phenolic formaldehyde.
( ) 58. Modern plastics may be polished, drilled, and cut much the same as metals.
( ) 59. In tooling leather, a better design will be obtained if the leather is kept moist.
( ) 60. Plastic materials may be bought opaque, transparent, or translucent.
( ) 61. The weft is the cross thread used on the shuttle in weaving.
( ) 62. Aluminum is a good conductor of electricity.
( ) 63. A thonging chisel is a tool used in metalwork.

Part II

Directions: Place the number of the part which makes the best answer to the statement in the parentheses before the sentence, as in the example.

Example: (3) The capital of United States is: (1) Boston (2) Chicago (3) Washington (4) New York.

In this example "Washington" is the correct answer; therefore, a figure "3" has been placed in the parentheses.

( ) 64. The area of a circle is equal to D^2 times (1) 3.1416 (2) .7854 (3) radius (4) 2 pi.
( ) 65. What metal makes up the greater portion of a tin can? (1) tin (2) iron (3) lead (4) brass (5) zinc
( ) 66. There are how many degrees in a triangle? (1) 90 (2) 120 (3) 180 (4) 300 (5) 360 (6) no correct number given
( ) 67. The drawing pencil having the softest lead of the following group is (1) HB (2) 2H (3) 4H (4) 4B (5) B.
( ) 68. An instrument used to lay out angles not found on the triangles: (1) architect's scale (2) protractor (3) dividers (4) compass.
( ) 69. Bisecting a line means dividing it into how many parts? (1) two (2) three (3) four (4) six (5) no correct number given
( ) 70. A tangent to a circle passes (1) through it (2) bisects it (3) touches the outside (4) forms a chord (5) forms an arc.
( ) 71. An orthographic projection can show all views of a solid symmetrical cylinder by (1) one view (2) two views (3) three views (4) four views.
( ) 72. The nail so made that it may be set below the surface of the wood is (1) box nail (2) finishing nail (3) common nail (4) shingle nail (5) gimp tack.
( ) 73. The part of the auger bit which pulls it into the wood is the the (1) nib (2) flute (3) twist (4) spur (5) shank.
( ) 74. What tool in wood turning is used to turn beads? (1) gouge (2) skew (3) round nose (4) parting tool.
( ) 75. The base for wood filler is made from (1) crushed wood (2) sawdust (3) crushed rock (4) glue (5) flour.
( ) 76. Interior views to show the material used in the construction of an object are shown by (1) reverse drawings (2) dotted lines (3) sectional views (4) isometrics.
( ) 77. Center lines in drawings are shown as (1) long lines of equal length (2) light solid lines (3) dotted lines (4) alternate long and short lines.
( ) 78. Lag screws are driven into place with a (1) hammer (2) wrench (3) screw driver (4) mallet (5) bit stock.
( ) 79. The best of the following woods for a hammer handle is (1) walnut (2) maple (3) cedar (4) hickory (5) pine (6) gumwood.
( ) 80. The backsaw most nearly resembles which of the following saws: (1) rip (2) hand crosscut (3) coping (4) jig (5) miter (6) keyhole.
( ) 81. Which of the following trees grow the largest? (1) oak (2) walnut (3) elm (4) redwood (5) cottonwood (6) pine (7) sycamore.
( ) 82. A board 2″ × 10″ × 18′ contains how many board feet of lumber? (1) 10 (2) 18 (3) 36 (4) 20 (5) 30 (6) 180 (7) no possible answer.

Part III

Directions: From the list of answers in Column II select the word which matches each item of Column I, and write the number of the answer in the parenthesis at the left of the item. The items of one section may be matched only with the answers in Column II of the same section.

Column I	*Column II*
( ) 83. The weight of a cubic foot of water.	1. alcohol
( ) 84. The thinner for shellac.	2. ampere
( ) 85. The number designating a 3/8-in. auger bit.	3. armature
	4. brass
( ) 86. The wire in the heating element of a toaster.	5. casein
	6. center punch
( ) 87. The size of fuse in amperes for the usual lighting circuit in the home.	7. copper
	8. counter sink
( ) 88. The number of board feet in a board 1″ × 6″ × 24″.	9. gasoline
	10. ingot

	Column I	*Column II*
( )	89. The term used to denote the flow of electricity.	11. lead
		12. Le Pages
( )	90. The tool used to prepare the surface of the wood so the head of the screw will be flush with the surface.	13. maple
		14. muriatic
		15. nichrome
( )	91. A glue made from milk.	16. one
( )	92. The device used to change alternating current voltages.	17. pig iron
		18. pine
( )	93. The tree from which sap for turpentine is obtained.	19. radial
		20. sulphuric
( )	94. The name of the large chunk of hot iron from which steel sheets are rolled.	21. transformer
		22. zinc
( )	95. The acid used to clean the black oxide from black iron.	23. 3
		24. 6
( )	96. The metal used to coat galvanized iron.	25. 15
( )	97. The development method used in drawing a sheet-metal pattern for a funnel.	26. 54
		27. 62.5
( )	98. The abbreviation for National Coarse threads.	1. acid
		2. alumina
( )	99. The abbreviation for a type of thread used in automobile work.	3. balsa
		4. bauxite
( )	100. The specific gravity of aluminum.	5. English
( )	101. The melting point of aluminum.	6. hardwood
( )	102. The specific gravity of iron.	7. India
( )	103. The ore used to make aluminum.	8. German
( )	104. The process of coating and soldering copper with solder in preparation for soldering.	9. isometric
		10. jointing
		11. kiln
( )	105. Another name for nickel silver.	12. N. C.
( )	106. The number of degrees in the other angle of the 30–60 degree triangle.	13. nickel
		14. pine
( )	107. A wood used in making model airplanes.	15. pumice
( )	108. An insect which destroys wood tissues in frame buildings.	16. rats
		17. rosin
( )	109. The process of bending saw teeth alternately from side to side.	18. N. F.
		19. scale
( )	110. A type of waterproof ink used in drawing.	20. setting
( )	111. What term describes drawings drawn in proportion but smaller than actual size.	21. slag
		22. termite
( )	112. A fine polishing material.	23. tinning
( )	113. A device in which wood is artificially dried.	24. 2.7
( )	114. The impurities of iron in the blast furnace.	25. 3.4
( )	115. The flux used in soldering copper.	26. 6.8
		27. 7.85
		28. 90
		29. 180
		30. 1220
		31. 1380

Key

Papers must be scored according to this key. Give one point for each correct answer. An omission is counted as an error. Possible score — 115. 115 — number wrong and omitted = score ———.

Part I

1. (+)	6. (—)	11. (—)	16. (+)	21. (—)	26. (+)
2. (—)	7. (—)	12. (—)	17. (+)	22. (—)	27. (+)
3. (—)	8. (—)	13. (+)	18. (+)	23. (—)	28. (+)
4. (—)	9. (+)	14. (—)	19. (—)	24. (—)	29. (+)
5. (+)	10. (+)	15. (+)	20. (—)	25. (—)	30. (+)
31. (—)	46. (—)	61. (+)	73. (4)	86. (15)	101. (29)
32. (—)	47. (—)	62. (+)	74. (2)	87. (25)	102. (27)
33. (—)	48. (—)	63. (—)	75. (3)	88. (16)	103. (4)
34. (+)	49. (+)		76. (3)	89. (2)	104. (23)
35. (—)	50. (—)	**Part II**	77. (4)	90. (8)	105. (8)
36. (—)	51. (+)		78. (2)	91. (5)	106. (28)
37. (—)	52. (—)	64. (2)	79. (4)	92. (21)	107. (3)
38. (—)	53. (—)	65. (2)	80. (5)	93. (18)	108. (22)
39. (+)	54. (+)	66. (3)	81. (4)	94. (10)	109. (20)
40. (—)	55. (—)	67. (4)	82. (5)	95. (20)	110. (7)
41. (+)	56. (—)	68. (2)	**Part III**	96. (22)	111. (19)
42. (+)	57. (+)	69. (1)		97. (19)	112. (15)
43. (—)	58. (+)	70. (3)	83. (27)	98. (12)	113. (11)
44. (—)	59. (+)	71. (2)	84. (1)	99. (18)	114. (21)
45. (+)	60. (+)	72. (2)	85. (24)	100. (24)	115. (17)

Table showing percentile of the frequency distribution for this industrial-arts test.

	Industrial Arts	*Bookkeeping*	*Junior Business Training*	*Business Arithmetic*	*Typewriting I*	*Typewriting II*
Possible score	115	100	98	70		
Highest score	105	99	96	63	116	169
99 %-ile	94	94	94	60	98	146
95 %-ile	85	85	90	50	89	118
90 %-ile	79	79	88	45	83	103
85 %-ile	76	74	85	41	79	97
80 %-ile	73	70	84	39	76	92
75 %-ile	71	66	82	37	73	87
70 %-ile	69	63	81	35	70	83
65 %-ile	68	61	79	32	67	79
60 %-ile	66	58	78	29	64	76
55 %-ile	65	55	77	28	61	72
50 %-ile	63	52	75	26	58	68
45 %-ile	61	49	74	24	55	65
40 %-ile	60	46	72	22	52	62
35 %-ile	58	44	70	20	49	59
30 %-ile	56	41	68	18	45	57
25 %-ile	54	39	65	16	41	54
20 %-ile	52	35	62	15	36	50
15 %-ile	49	32	58	12	30	46
10 %-ile	46	27	54	10	23	41
5 %-ile	41	21	50	7	13	36
1 %-ile	33	13	42	2	2	21
Lowest score	27	3	30	0	0	0
No. of cases	895	1427	764	392	2051	680

Read table thus: The highest median score reported for any school for freshman English was 98; 99 per cent of the median scores did not exceed 95 (1 per cent reached or exceeded this score); 95 per cent did not exceed 89 (5 per cent reached or exceeded this score); and so forth. The medians for the other subjects may be interpreted in the same manner.

MACHINE-SHOP TEST

GEORGE C. DONSON
High School
Washington, Pa.

Direction: Circle the correct number at the left. Time — 15 minutes.

I. A jammed nut is one
1. That is covered with rust
2. That has imperfect thread
3. That is tightened against another nut
4. Used only in automobile construction
5. That is held by a lock washer

II. A live center in the lathe differs from the dead center in that it has
1. A different angle at the point
2. Use only on turret lathes
3. Circular motion
4. A tempered point
5. An oil groove

III. The gib on the cross slide is used
1. To lock the carriage
2. To compensate for wear
3. To reverse the action of the cross slide
4. To prevent the carriage from breaking under strain
5. For a safety device

IV. In cutting an 8P — U.S.S. thread (N.C.) on a standard gear change lathe, one would use (if lead screw is 4P)
1. A gear of 16 teeth on the stud and 35 teeth on the lead screw
2. A gear of 20 teeth on the stud and 32 teeth on the lead screw
3. A gear of 16 teeth on the stud and 55 teeth on the lead screw
4. A gear of 16 teeth on the stud and 32 teeth on the lead screw
5. Gears of any number of teeth may be used in cutting even threads.

V. In cutting an 8P — U.S.S. thread the split nut should be engaged (with lead screw of 4P)

1. On the numbered line of the dial
2. On the line between the numbered lines
3. At any place regardless of dial readings
4. On any lines on the dial
5. At every second turn of the lead screw

VI. The lead and the pitch are the same
1. On a worm thread
2. On a double thread
3. On an acme thread
4. On a triple thread
5. On a single thread

VII. The per cent of carbon in cast iron is
1. 20 per cent
2. 10 per cent
3. 5 per cent
4. 3.5 per cent
5. 6.2 per cent

VIII. Rex 95 on a cutting tool bit means
1. .95 of 1 per cent carbon
2. 95 per cent carbon
3. 5 per cent carbon
4. .095 per cent carbon
5. .0095 per cent carbon

IX. The marking on a piece of steel, 2354, the figure 2 means
1. Mild steel
2. Tool steel
3. Nickel steel
4. Molybdenum alloy
5. Tungsten steel

X. The decimal equivalent of 7/16 is
1. .3125 2. .5625 3. .2515
4. .2035 5. .4375

XI. The outside diameter of a 42-toothed gear 10P is
1. 4.01 2. 8.4 3. 4.4
4. 4.8 5. 4.2

XII. To cut a gear of 42 teeth

	Index Circle	*Turns*	*Holes*	*Additional Holes*
1.	42	0	40	0
2.	21	2	10	5
3.	84	1	40	0
4.	126	1	40	6
5.	Any	1	10	4

Key

I. 3	V. 1	IX. 3
II. 3	VI. 5	X. 1
III. 2	VII. 3.5 per cent	XI. 3
IV. 4	VIII. 1	XII. 1

TIRES AND DEFENSE

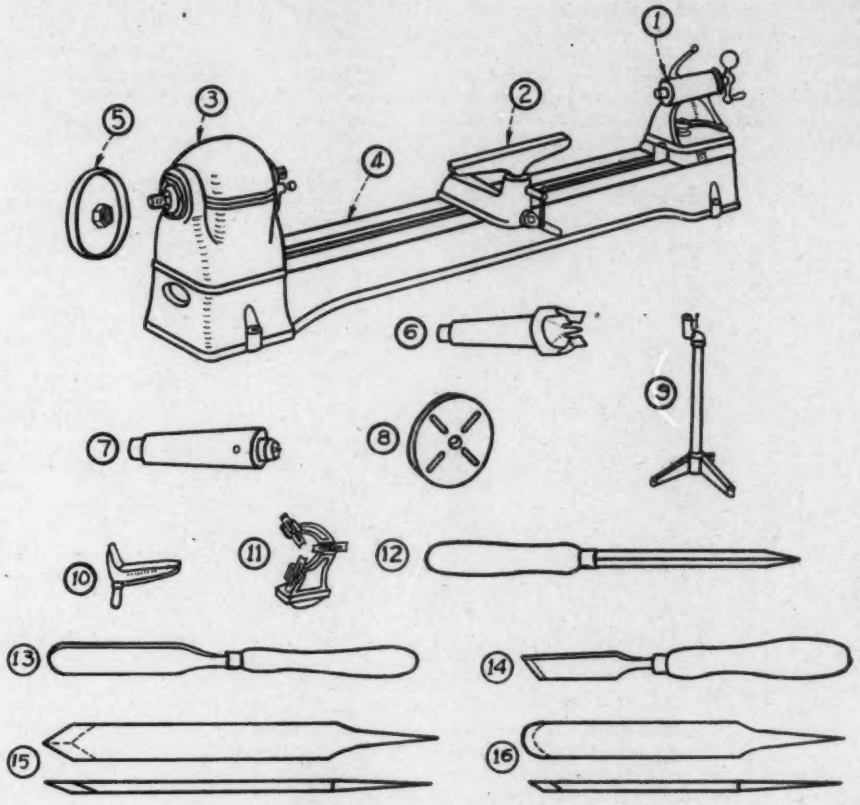
Our government bluntly states that the present emergency will continue for the duration. Civilian use of rubber is now cut to the bone. Get the most out of your tires by following these suggestions:

1. Drive at moderate speeds.
2. Keep tires properly inflated.
3. Avoid stopping short or making jack-rabbit starts.
4. Avoid striking curbs, road holes, rocks, etc.
5. Repair all cuts, leaks, and breaks promptly.
6. Change wheel positions every 5000 miles.
7. Check alignment of front axle whenever tires are rotated.
8. Before the tire is worn down to fabric have it retreaded.

ELEMENTARY WOOD-TURNING TEST

G. L. SIMNICHT
U. S. Navy Air Corps,
Chicago, Ill.

Directions: Place the name of the tools, or the correct names of the tool parts, opposite their respective numbers in the answer column.



Elementary wood-turning test

1. ..... 9. .....
2. ..... 10. .....
3. ..... 11. .....
4. ..... 12. .....
5. ..... 13. .....
6. ..... 14. .....
7. ..... 15. .....
8. ..... 16. .....

Directions: Insert the correct word or words in the space provided for them.

17. To square ends use a ..... tool.
18. To smooth a cylinder use a large.....
..... chisel.
19. To make vees and beads use a .....
..... chisel.
20. A cove is made with a .....
21. For roughing use a large .....
22. Careless operation makes the lathe a....
.....machine.
23. Three types of turning are:
(*a*) .....
(*b*) .....
(*c*) .....

25 is a perfect score. Your score is.....

Key

1. Tailstock	14. Skew
2. Tool rest	15. Spear point
3. Headstock	16. Round nose
4. Bed	17. Parting tool
5. Handwheel	18. Skew
6. Live center	19. Spear
7. Dead center	20. Gouge
8. Faceplate	21. Gouge
9. Floor stand	22. Dangerous
10. Right-angle tool rest	23. Chuck
11. Steady rest	24. Faceplate
12. Parting tool	25. Spindle
13. Gouge	

TEST FOR GENERAL SHOP

WILLIAM H. BOWERS

High School

Tuckahoe, N. Y.

Industrial background test embracing textiles, electricity, pottery, cabinetmaking, designing and drafting, patternmaking, molding, machine-shop practice, and sheet-metal work.

Directions: On the following pages are 100 statements. Some true, some false. Read each statement carefully before answering it. If you think the statement is a true one, place a plus + before it. If, in your opinion, the statement is false, place a minus — before it. Deduct 1 per cent for each statement answered *incorrectly*.

Textile Industry

1. Most of the textile factories are in Ohio and Pennsylvania.
2. The textile industry began in the year 1875, in the United States.
3. The average wage in the textile industry is $48 per week.
4. Most of the workers in the textile industry are classed as unskilled employees.
5. The women outnumber the men in this industry.
6. The cotton-woven-goods industry ranks second in importance in the United States.
7. The woolen-worsted-goods industry employ more wage earners than the meat-packing (wholesale) industry.
8. The hosiery industry ranks in importance with the first ten industries in this country, according to wage earners employed.
9. The mens-and-boys suit industry employs 200,000 wage earners yearly.
10. The four principal fibers used in the manufacture of textile are cotton, flax, wool, and silk.
11. The cotton-gin invention eliminated large-scale manufacture.
12. Thread, shoelaces, and tape are made from cotton yarn.
13. Linen yarn is made from flax fiber.
14. Damask table linen is woven by large power looms.
15. Cotton is more expensive than linen.
16. Linen has inferior lasting qualities in comparison with cotton.
17. Raw wool doesn't require much cleaning.
18. Broadcloth, tweed, and felt are made from wool.
19. Japan, China, and Italy produce most of the raw silk.
20. Long experience and considerable training are necessary to become a designer or cutter, in the clothing trades.

The Electrical Industry

21. There is a large and growing demand for electrical workers.
22. The inside wireman is usually capable of repairing motors and generators.
23. Outside wiring consists of running wires for the transmission of power, street lighting, and communication lines.
24. A great amount of skill is necessary to do outside wiring.
25. The work of the inside wireman is very dangerous.
26. An inside wireman's work is very unhealthy.
27. A knowledge of mechanical drawing and practical mathematics are of help to the inside wireman.
28. The electrician is a well-paid mechanic.
29. The field of electrical engineering offers an alluring opportunity for advancement.
30. Opportunities for advancement are decreasing yearly in the electrical trades.

Pottery

31. The word *pottery* is applied to all objects formed of clay and hardened by heat.
32. Earthenware is fired at a very high heat.
33. Stoneware is easily scratched with a knife.
34. The glaze on porcelain appears to be entirely distinct from the body.
35. Pottery is a very ancient craft.
36. The earliest pottery was made on the potter's wheel.
37. The American Indian made beautifully decorated pottery.
38. The Chinese are the world's greatest potters.
39. Josiah Wedgewood was a famous American potter.
40. Pottery was made in Burlington, N. J., in 1685.
41. Trenton, N. J., is a large pottery center.
42. Clays range in color from white through yellow, gray, green, red and from blue to black.
43. Clay is invariably found in a pure state.
44. Clay, when dry, is hard but it becomes harder when moistened.
45. Making pottery by hand with coils of clay rope was a method used by the American Indian.
46. The careful design of a pottery project is essential to successful results.
47. Much more accurate building can be done by hand than by using the potter's wheel.
48. Clay slip is used to fasten handles, knobs, and appendages.
49. Handles and knobs must be made on a potter's wheel.
50. Portable electric kilns are clean, easy to install and to control.

Furniture and Cabinetmaking

51. Today machine work is the predominating feature in the furniture-making industry.
52. The furniture industry ranks fourth in importance in the United States.
53. All work in a furniture factory is carried on from full-size drawings.
54. The work in each department is directed by a designer.
55. A machine operator is a highly skilled worker.
56. Bench and hand tools are used when assembling pieces of finished furniture.
57. Veneer is rarely used in a modern furniture factory.
58. Most of the work done in a factory may be classed as skilled labor.
59. The ventilation is poor in most modern factories.
60. Most of the work in a furniture factory is heavy.
61. The trade offers good opportunities, if the individual will prepare for it.
62. This industry is recruited from the ranks of skilled labor.
63. The assembler requires a learning period of three to four years.
64. The designer is the best paid job in the factory.
65. A factory usually works ten hours per day.

Metalworking Trades
The Designer and the Draftsman

66. The machine draftsman and the designer do the same job in industry.
67. The draftsman plans the complete job in its entirety.
68. Years of training are required to be a successful designer.
69. A good designer may earn $50,000 yearly.
70. The draftsman receives $50 weekly to start with.
71. The draftsman must be a college graduate.

The Patternmaker

72. The patternmaker is often called the aristocrat of woodworkers.
73. The work of the patternmaker is necessary in securing castings.
74. A great amount of handwork is done by a patternmaker.
75. The patternmaker's work is very dangerous.
76. The patternmaker's work is heavy and dirty.
77. The term of apprenticeship is two years.
78. The average woodworker usually has a difficult time picking up this trade.
79. Shop mathematics and mechanical drawing are essential to a patternmaker.
80. A patternmaker receives only 50 cents an hour.

Molding and Coremaking

81. The molder places the pattern in the sand, pours the molten metal and produces a rough casting.
82. Castings are made from brass and bronze only.
83. The molder does light work usually.
84. The work of a molder and coremaker is the same.
85. Both the molder and the coremaker receive good wages.

The Machinist

86. In the olden days a machinist worked and was trained on one machine only.
87. A modern machinist is usually an all-round mechanic.
88. For the past ten years few apprentices were trained in this industry.
89. Today a machinist receives only 50 cents per hour.
90. The machinist is capably trained in one year.
91. The machinist and the toolmaker do identical work in a factory.
92. The machinist has great opportunities for advancement.
93. The machinist's occupation is very dangerous.
94. A high school graduate with technical school training has the necessary groundwork to become a successful machinist.
95. Many factory superintendents were formerly machinists.

The Sheet-metal Industry

96. The work of a sheet-metal worker consists primarily in laying out tin sheets for gutters, skylights, metal ceilings, and sidewalks.

97. The work is heavy and dangerous.
98. The sheet worker has little chance for bettering himself.
99. The cutting of heavy metal is done by hand.
100. High school graduation gives the necessary groundwork for one who desires to enter the sheet-metal industry as an apprentice.

References:

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Trade Foundations, by Rogers and others.

Leading Industries in the United States According to Wage Earners Employed. Bulletin, 1940, by United States Bureau of Commerce, Washington, D. C.

Key

1. —	21. +	41. +	61. +	81. +
2. —	22. —	42. +	62. —	82. —
3. —	23. +	43. —	63. +	83. —
4. +	24. —	44. —	64. +	84. —
5. +	25. —	45. +	65. —	85. +
6. +	26. —	46. +	66. —	86. —
7. +	27. +	47. —	67. —	87. —
8. —	28. +	48. +	68. +	88. +
9. —	29. +	49. —	69. +	89. —
10. +	30. —	50. +	70. —	90. —
11. —	31. +	51. +	71. —	91. —
12. +	32. —	52. —	72. +	92. +
13. +	33. —	53. +	73. +	93. —
14. +	34. —	54. —	74. +	94. +
15. —	35. +	55. —	75. —	95. +
16. —	36. —	56. +	76. —	96. +
17. —	37. +	57. —	77. —	97. —
18. +	38. +	58. —	78. +	98. —
19. +	39. —	59. —	79. +	99. —
20. +	40. +	60. —	80. —	100. +

MACHINE DRAWING TEST

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Specific Directions: Read each statement carefully. Then choose the right term from the list at the head of the statements and place the letter which precedes it in the parentheses at the left of the statement.

(*a*) effective diameter
(*b*) title
(*c*) feather key
(*d*) publicity
(*e*) erection drawings
(*f*) assembly working drawings
(*g*) setscrews
(*h*) leather
(*j*) pitch diameter
(*k*) copper
(*l*) Whitworth
(*m*) babbitt
(*n*) interpolated section
(*o*) concrete
(*p*) wrought iron
(*q*) cast iron
(*r*) understand
(*s*) full section
(*t*) working drawing
(*u*) lead

( ) 1. A mechanical drawing which completely describes the shape and size, and gives specifications for the kinds of material, methods of finish, accuracy required for making a single part, or a complete machine or structure.

( ) 2. A view as the object would appear if cut entirely across.

( ) 3. A metal which contains from 2 to 6 per cent of carbon and varying amounts of silicon, sulphur, manganese, and phosphorus. It is crystalline in structure and breaks rather easily under a sudden shock. This metal can be run into molds of any desired shape.

( ) 4. A building material used chiefly for the foundations of heavy machinery.

( ) 5. An antifriction metal sufficiently fusible to be melted in a common ladle. Its use is very desirable because of its property of forming a perfect bearing easily without the necessity of reboring.

( ) 6. A metal having a reddish color. It is soft compared with iron and can be cast into molds and rolled or hammered into any desired shape, either hot or cold. It is much more expensive than iron, but is also much more durable when exposed to the weather, and does not rust as iron does.

( ) 7. A material used principally as belting for transmitting rotary motion from one shaft to another.

( ) 8. A mechanical drawing used when only a few machines are to be made. Each part is fully dimensioned, which makes it possible for the mechanic to build the machine from this drawing instead of having to refer to several detail sheets. By this method a great deal of time is saved in the drafting room, since each detail does not have to be drawn separately.

( ) 9. Information intended to arouse interest, usually appearing in print.

( ) 10. A legend which gives the name of the part, the number required for one machine, and the material of which it is to be made.

( ) 11. The diameter at the root of the threads.

( ) 12. An exceedingly soft, durable, and heavy metal. It is not suited for any work where it is put under strain. It is used largely for plumbing and in places which are subject to the corroding action of chemicals.

( ) 13. A small part of a machine used to fasten two parts together, allowing one to slide on the other, but not allowing one to turn without turning the other.

( ) 14. The diameter of the pitch circle of a gear. It is used in almost all gear calculations.

( ) 15. The English thread standard with points rounded. An angle of 55 deg. is used instead of 60 deg.

( ) 16. A section usually applied to long members, either straight or curved, of constant shape in cross sections, as, for example, the spokes of a wheel, the rim of a wheel, arms and brackets of various kinds of machines. The revolved section is made by passing a cutting plane perpendicular to the plane of the view and revolving it about the center line of the section cut, until it is parallel with the plane of projection. Such sections are used in architectural and structural work, as well as in machine drawing.

( ) 17. A metal which contains practically no carbon and has a definite fiber or grain. Its melting point is so high that it is almost impossible to make it fluid enough to cast into molds. It is usually rolled or hammered into the desired shape in the rolling mill or the blacksmith shop. This metal cannot be broken with a hammer, but can be bent and welded.

( ) 18. Mechanical drawings which are used in the putting up of a machine. Each part is numbered or named so that it may be easily identified. These drawings give the exact location of each part and the proper order of procedure in the installation of the machine.

( ) 19. Small machine screws which, instead of clamping parts rapidly together, are used to hold machine parts in place by being pressed against them. As the head is used only for turning the screw into place, it is usually made much smaller than the standard bolthead.

( ) 20. To grasp the purpose or meaning of words, signs, information, or explanations.

Key

1. Working drawing
2. Full section
3. Cast iron
4. Concrete
5. Babbitt
6. Copper
7. Leather
8. Assembly working drawing
9. Publicity
10. Title
11. Effective diameter
12. Lead
13. Feather key
14. Pitch diameter
15. Whitworth
16. Interpolated
17. Wrought iron
18. Erection drawings
19. Setscrews
20. Understand

TEST FOR PREFLIGHT AVIATION COURSE

HAROLD THEODORE GLENN

David Starr Jordan High School
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Test — Unit IV

1. Give two main differences between the two-stroke cycle and the four-stroke cycle engine. .....

2. What are the four strokes of a four-cycle engine?
(1) ..... (2) .....
(3) ..... (4) .....

3. What is the main difference between the Diesel and the gasoline engine? .....
.....

4. What are three of the most popular types of cylinder arrangements used on modern airplane engines?
(1) ..... (2) .....
(3) .....

5. Give the name of 15 parts of an airplane engine:
(1) ..... (2) .....
(3) ..... (4) .....
(5) ..... (6) .....
(7) ..... (8) .....
(9) ..... (10) .....
(11) ..... (12) .....
(13) ..... (14) .....
(15) .....

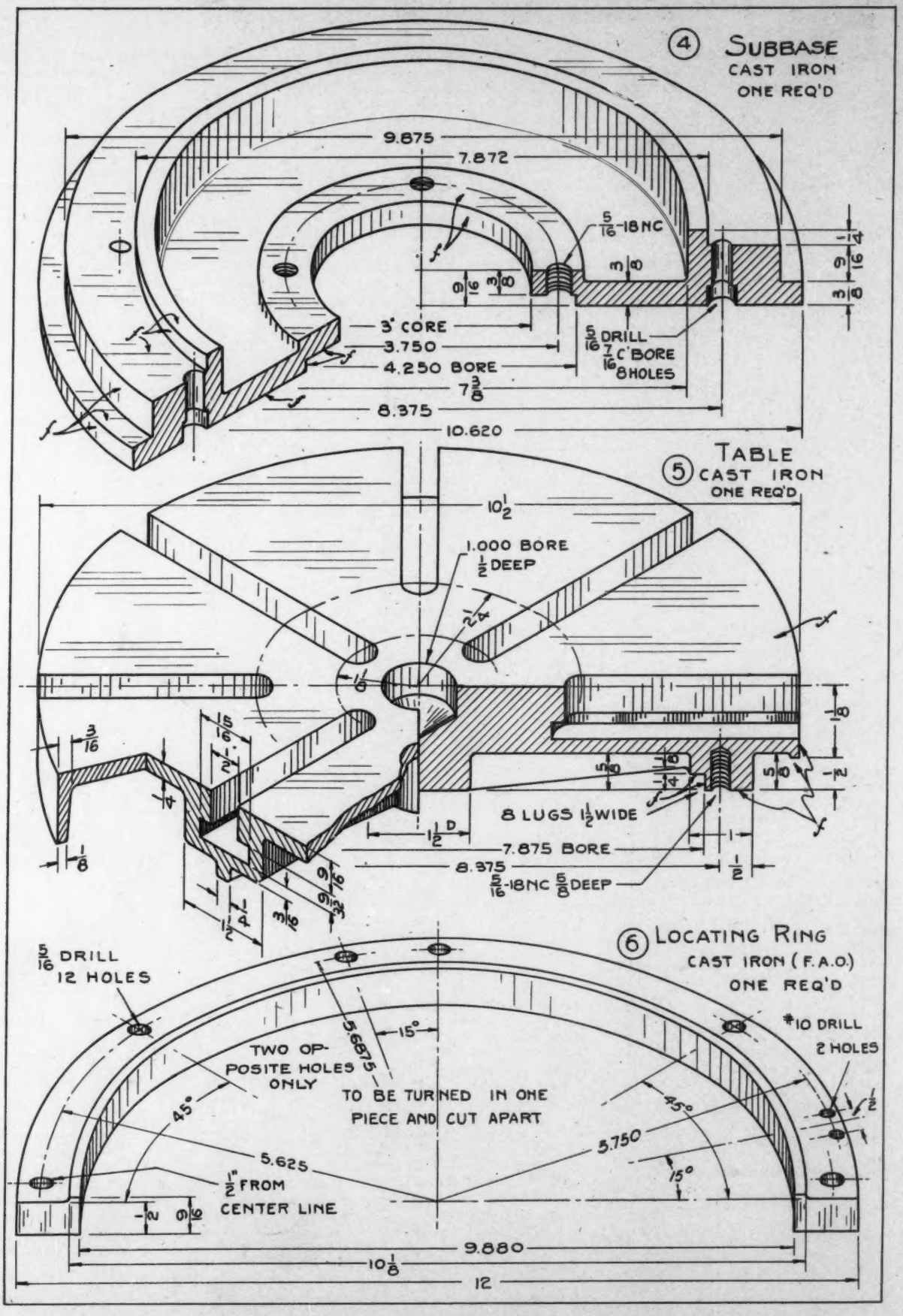
6. The modern airplane engine weighs ..... lb. per horsepower.

7. An out of balance motor causes .....
.....

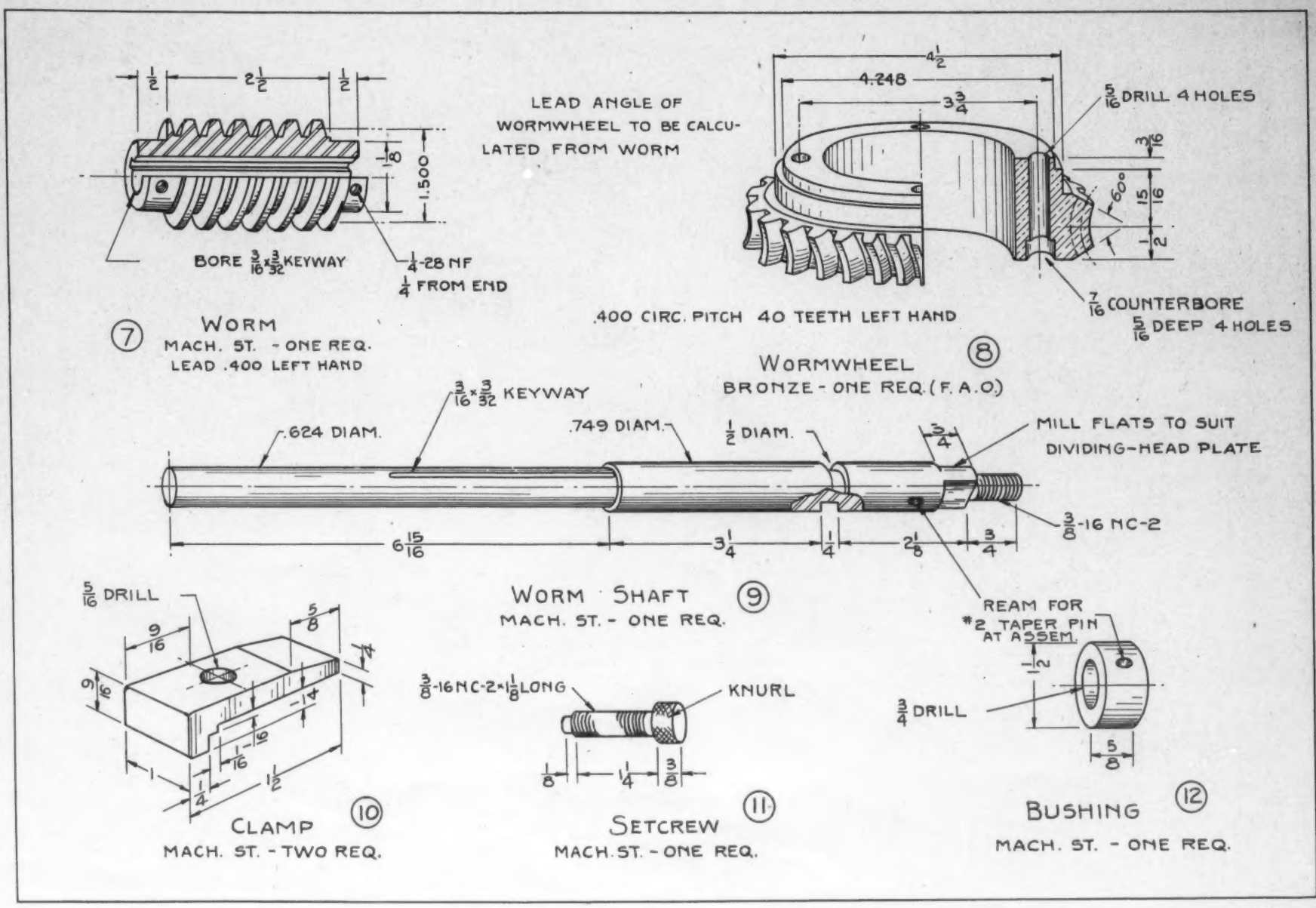
8. The liquid used in aircraft engines for cooling purposes is called .....

9. Fins are for the purpose of .....
.....

(Continued on page 69)



Rotary milling table by William A. DeVette, Technical High School, Erie, Pa. (For assembly, details, and description, see pages 24, 25, and 30 of the January, 1943, issue)



Rotary milling table by William A. DeVette, Technical High School, Erie, Pa. (For assembly, details, and description, see pages 24, 25, and 30 of the January, 1943, issue)

(Continued from page 64)

10. The correct air fuel ratio for power is ..... to 1.

11. Give three advantages of the solid injection system over the carburetor.
(1) ..... (2) .....
(3) .....

12. The ..... fills the cylinder with a full charge in high altitudes where the air is rarified.

13. The spark plug furnishes the .... which ignites the charge inside of the cylinder.

14. The breaker points are connected to the ..... winding.

15. The secondary current operates on ..... volts.

16. The movement of magnetic lines of force across a coil of wire ..... current in that coil.

17. A magneto generates its own .... current.

18. Iso-octane has an octane rating of ....

19. Low octane gasoline will ..... in high compression engines.

20. Superchargers driven by the exhaust are called ..... superchargers.

21. S.A.E. 40 oil is heavier than S.A.E. 30 oil.

22. Name three types of starters:
(1) ..... (2) .....
(3) .....

23. Name five engine instruments necessary to proper flight:
(1) ..... (2) .....
(3) ..... (4) .....
(5) .....

24. A constant speed propeller pitch is controlled by the .....

25. Feathering a propeller means ....

Key — Unit IV

1. Two-stroke cycle fires every revolution, four-stroke cycle every two revolutions, and two-stroke cycle uses ports instead of valves.
2. Intake; compression; power; exhaust.
3. The Diesel ignites the fuel by high pressure instead of using a spark.
4. In line "V" type; radial.
5. (1) Piston (6) Cylinder (11) Manifold
(2) Rings (7) Crankcase (12) Oil pump
(3) Connecting rod (8) Crankshaft (13) Carburetor
(4) Wrist pin (9) Timing gears (14) Spark plug
(5) Valve (10) Cam ring (15) Magneto
6. 1,2
7. Vibration
8. Ethyl Glycol
9. Conducting the heat from the cylinder to the air. Their construction gives greater cooling area.
10. 12
11. (1) More equal distribution
(2) No Venturi icing
(3) Highly maneuverable
12. Supercharger
13. Spark
14. Primary
15. 20,000
16. Induces
17. Primary
18. 100
19. Ping
20. Thurbo
21. Heavier
22. Inertia; cartridge; electric direct drive
23. (1) Manifold pressure
(2) Oil pressure
(3) Engine temperature
(4) Oil temperature
(5) Engine tachometer
24. Engine speed
25. Turning the blades so that they are parallel to the line of flight.

WOODWORK TESTS FOR JUNIOR HIGH SCHOOL

LLOYD R. WILSON
Waterloo, Iowa

Part I. Yes and No Questions

Directions: Underline the word *Yes* if you think the answer is yes. Underline the word *No* if you think the answer is no.

Yes No 1. Are nails driven with a hammer?
Yes No 2. Are there 12 inches in one foot?
Yes No 3. Is varnish thinned with turpentine?
Yes No 4. If a person planes entirely across the end of a piece of wood, is the corner likely to split?
Yes No 5. Is a jack plane larger than a block plane?
Yes No 6. Should surfaces, which are to be joined, be sanded?
Yes No 7. Is shellac thinned with turpentine?
Yes No 8. Is the rule placed on edge for accurate measuring?
Yes No 9. Are auger bits ordinarily used in a hand drill?
Yes No 10. Is a countersink used for flat-head screws?
Yes No 11. Is the T bevel used to test 90-deg. angles?
Yes No 12. Is the tongue of the framing square larger than the blade?
Yes No 13. Should long strokes be used when starting a saw cut?
Yes No 14. Should the roundhead screw be countersunk?
Yes No 15. Should the toe of the plane be pointed toward you when sighting for levelness of plane iron?
Yes No 16. Is the marking gauge usually pushed when marking stock to width?
Yes No 17. Should the brace be turned in a clockwise direction for boring holes?
Yes No 18. Are the teeth of a wood file coarser than those of a wood rasp?
Yes No 19. Is the No. 1 sandpaper coarser than No. 0?
Yes No 20. Is white pine an example of hardwood?
Yes No 21. The try square and framing square are two names for the same tool.
Yes No 22. The nail set is used to remove nails.
Yes No 23. Is the bench hook a device on which to hang hand tools?
Yes No 24. Is it best to bore entirely through from one side when using a brace and bit?
Yes No 25. Are the brace and hand drill two different tools for the same purpose?

Part II. True-False

Directions: The letters *T* and *F* precede each of the following statements. Encircle the letter *T* if you think the statement is true. Encircle the letter *F* if you think the statement is false.

T F 1. The wood rasp and cabinet file are two names for the same tool.
T F 2. Files are used where cutting tools cannot be used.
T F 3. Files are classified according to shape.
T F 4. Filing against the grain makes a smoother job than filing with the grain.
T F 5. The file cleaner is used to clean sandpaper.
T F 6. The following are laying out tools.
1. Rule
2. Try square
3. Framing square
4. T bevel
5. Marking gauge
6. Dividers
T F 7. The coping saw is used for cutting circles and curves.
T F 8. The half-round file belongs to the cabinet group.
T F 9. All rattail files are the same size.
T F 10. Always sand across the grain when sanding work.
T F 11. The coping saw cuts on the pull stroke.
T F 12. Good coping-saw work requires very little filing if any.
T F 13. For sanding curves use a sandpaper block.
T F 14. In the order of use, use the finest sandpaper first.
T F 15. The ripsaw is used to cut with the grain of the wood.
T F 16. A bevel and a chamfer are the same.
T F 17. Sandpaper is to be used across the grain of wood.
T F 18. The hammer is classified as one of the laying out tools.
T F 19. The try square is something to pound nails with.
T F 20. Crosscut saw teeth and ripsaw teeth are identical in size and shape.
T F 21. Nails have more holding power than screws.
T F 22. Oily rags from the finishing of projects should be kept in a metal container.
T F 23. A nail set is used to sink a screw down even with the surface.
T F 24. A board will plane smooth against the grain.
T F 25. The saw is a new invention.
T F 26. The T bevel is used to test 90-deg. angles.
T F 27. The tongue of the framing square is larger than the blade.
T F 28. The try square has all of the markings that the framing square has.
T F 29. Nail sets are used on common nails.
T F 30. Pine is classified as a softwood.

Part III. Multiple-Choice Questions

Directions: In each of the following sentences underline the word in parentheses that makes the best meaning out of the statement.

1. Which plane has the longest bed? (1) jack (2) jointer (3) smooth
2. Nails are usually purchased by the (1) thousand (2) gross (3) ounce (4) pound.
3. Shellac is thinned by the use of a liquid called (1) turpentine (2) alcohol (3) linseed oil.
4. Which of the following planes does not have a cap iron? (1) jack (2) jointer (3) smooth (4) block
5. In finishing a project which of the following is first? (1) wax (2) shellac (3) varnish (4) stain
6. A nail set is used on (1) screws (2) common nails (3) finishing nails (4) tacks.

7. The correct saw to use in cutting curves is (1) back (2) rip (3) coping (4) back.
8. Nails are purchased by the (1) ounce (2) pound (3) dozen (4) hundred.
9. Which of the following tools belong to the laying out group? (1) nail set (2) hammer (3) T bevel (4) coping saw.
10. Which of these nails has the largest head? (1) casing (2) common (3) finish
11. Which of the following abbreviations pertain to screws? (1) S2s (2) F&S (3) f.h.b.
12. The miter saw and the (1) ripsaw (2) crosscut (3) backsaw (4) coping are similar.
13. The part of the brace into which the tang of the bit fits is called the (1) ratchet (2) chuck (3) socket.
14. The face of the nail hammer is (1) concave (2) convex (3) flat.
15. The backsaw resembles which of the following saws? (1) crosscut (2) compass (3) miter

Part IV. Completion Questions

Directions: The following statements are incomplete and need one or more words to make the sentence a true statement. Fill in the blanks.

1. Number 10 stamped on the heel of the saw indicates the number of ..... per inch.
2. The part of the plane that clamps the plane iron in place is called the .....
3. After close-grained woods have been stained, what finishing coat is usually applied next? .....
4. The bit used to taper the hole for the head of a flathead screw is called a .....
5. The number of an auger bit for boring a ½-in. hole should be a number .....
6. The part of the try square which contains the numbers is called the .....
7. A ..... is used to cut with the grain of the wood.
8. ..... hammers are used to draw nails out of wood if the head protrudes far enough to get a hold on it.
9. A .... is used to check edges for squareness.
10. The name of the tool used to check chamfers and bevels is .....
11. What finishing coat is usually applied next after the stain to act as a sealer? .....
12. To get the smoothest cut one must plane ..... the grain of the wood.
13. The part of the plane that regulates the depth of the cut is called the ....
14. The bit is held in a ..... when boring a hole.
15. The width of a saw cut is called a .....

Part V. Matching Questions

Directions: Place in the parenthesis of column II, the number of column I that answers the statement or description.

I	*II*
1. Hammer	1. ( ) Flathead Bright
2. Mallet	2. ( ) Used with a chisel
3. Rule	3. ( ) Part of the plane
4. Frog	4. ( ) Measurement for nails
5. Coping Saw	5. ( ) Used to clean brushes
6. Ripsaw	6. ( ) Used to drive nails
7. Penny (D)	7. ( ) Measuring tool
8. Turpentine	8. ( ) For sawing curves
9. Countersink bits	9. ( ) For flathead screws
10. F.h.b.	10. ( ) For sawing parallel to the grain
11. Alcohol	11. ( ) Place to work
12. Bit	12. ( ) Device for holding articles
13. R.h.b.	13. ( ) Roundhead blued
14. Vise	14. ( ) Shellac thinner
15. Bench	15. ( ) Tool for making round holes

Test Keys

Part I
1. Yes
2. Yes
3. Yes
4. Yes
5. Yes
6. No
7. No
8. Yes
9. No
10. Yes
11. No
12. No
13. No
14. No
15. Yes
16. Yes
17. Yes
18. No
19. Yes
20. No
21. No
22. No
23. No
24. No
25. Yes

Part II
1. F
2. T
3. T
4. F
5. F
6. T
7. T
8. T
9. F
10. F
11. T
12. T
13. F
14. F
15. T
16. F
17. F
18. F
19. F
20. F
21. F
22. T
23. F
24. F
25. F
26. F
27. F
28. F
29. F
30. T

Part III
1. 2
2. 4
3. 2
4. 4
5. 4
6. 3
7. 3
8. 2
9. 3
10. 2
11. 3
12. 3
13. 2
14. 3
15. 3

Part IV
1. Points
2. Lever cap
3. Shellac
4. Countersink
5. 8
6. Blade
7. Ripsaw
8. Claw
9. Try square
10. T bevel
11. Shellac
12. With
13. Adjusting nut
14. Brace
15. Kerf

Part V
1. 10
2. 2
3. 4
4. 7
5. 8
6. 1
7. 3
8. 5
9. 9
10. 6
11. 15
12. 14
13. 13
14. 11
15. 12

INDUSTRIAL-ARTS TEST

LLOYD R. WILSON

Waterloo, Iowa

This test is prepared for those teaching several areas of shopwork. It can be used as a check on the completion of the whole group. It has proved to be worth while in schools where these courses are not given as units.

Woodwork Test

Encircle the letter *T* if you think the statement is true.

Encircle the letter *F* if you think the statement is false.

Do Not Guess

T F 1. Auger bits are numbered in sixteenths of an inch.
T F 2. The block plane is the smallest plane used in the school shop.
T F 3. A ripsaw is used to cut with the grain of the wood.
T F 4. The expansive bit can be adjusted for many different size holes.
T F 5. A bevel and a chamfer are the same.
T F 6. A pilot hole is made for the unthreaded part of a screw.
T F 7. The try square is something to drive nails with.
T F 8. The hammer is classified as one of the laying out tools.
T F 9. Sandpaper is used across the grain of the wood.
T F 10. Shellac is thinned with turpentine.
T F 11. The cost of white pine per board foot is more than the cost of walnut per board foot.
T F 12. There are two methods of seasoning lumber.
T F 13. Crosscut saw teeth and ripsaw teeth are identical in size and shape.
T F 14. Bench tops are made of maple.
T F 15. Varnish is thinned with turpentine.
T F 16. Nails have more holding power than screws.
T F 17. Stain is applied to a project after the first coat of varnish.
T F 18. Quartersawed lumber will warp more than plain sawed lumber.
T F 19. Oily rags from the finishing of projects should be kept in a fireproof container.
T F 20. The compass saw is something to draw circles with.
T F 21. The teeth of the scroll-saw blade must point downward.
T F 22. A skew chisel is something used in wood turning.
T F 23. The jaws of a woodworker's vise should be lined with wood.
T F 24. The T bevel is used to measure angles.
T F 25. In making a mortise-and-tenon joint, we fit the mortise into the tenon.

Drawing Test

Encircle the letter *T* if you think the statement is true.

Encircle the letter *F* if you think the statement is false.

T F 1. The scale and rule are the same.
T F 2. Lettering guide lines should be light.
T F 3. The T square is to be used as a hammer.
T F 4. Vertical lines should be drawn from the bottom to top.
T F 5. The bottom edge of the T square is used for drawing.
T F 6. Drawing pencils should be sharp.
T F 7. Dimension lines should be heavier than object lines.
T F 8. Good lettering improves a drawing.
T F 9. The 45-degree triangle has two equal angles and sides.
T F 10. The over-all dimension should be the furthest from the outline of the object.
T F 11. Horizontal lines are drawn from left to right.
T F 12. The scale is something to measure board feet with.
T F 13. All horizontal lines are drawn with the use of the T square.

T F 14. Arrowheads are placed on the object lines.
T F 15. Three-view drawings are the only kind made.
T F 16. Invisible areas are indicated by short broken lines.
T F 17. Good drawings must have sharp and clean cut lines.
T F 18. All triangles have three included angles.
T F 19. When drawing to scale the actual measurements are put on the finished drawing.
T F 20. The dividers are used to transfer measurements.
T F 21. The compass is an instrument used for drawing circles.
T F 22. Good drawing boards are made of softwood.
T F 23. Freehand drawings are made with the use of the triangle.
T F 24. All drawings must be centered to look well balanced.
T F 25. In three-view drawings the top view is placed directly above the end view.

Electrical Test

Encircle the letter *T* if you think the statement is true.

Encircle the letter *F* if you think the statement is false.

T F 1. All electricity is dangerous.
T F 2. Pennies should be used as fuses.
T F 3. Poor wiring will cause a fire.
T F 4. All electrical appliances should be disconnected when not in use.
T F 5. When disconnecting electrical appliances, one should pull on the cord instead of the plug.
T F 6. Fuses are of no value at all; they are just another thing to buy.
T F 7. As wire increases in size the number increases.
T F 8. Toggle switches and push button switches are just alike.
T F 9. Always pull the switch when working on any electrical wires.
T F 10. Power lines which have fallen as the result of a storm are harmless.
T F 11. An underwriter's knot should be tied at the end of each cord.
T F 12. Each house must be equipped with an entrance switch and a fuse block.
T F 13. A fuse is placed in the circuit for safety purposes only.
T F 14. A blown fuse is usually caused by a short circuit.
T F 15. The most common lighting circuit voltage is 110 volts.
T F 16. Most modern light bulbs are frosted on the inside.
T F 17. Rubber is the best material with which to insulate wire.
T F 18. Three wires must be connected to every piece of electrical apparatus.
T F 19. All splices should be taped with friction tape.
T F 20. Branch fuses should be larger than entrance box fuses.
T F 21. Scientists have discovered all there is to know about electricity.
T F 22. The electric meter shows the amount of electricity used.
T F 23. Most homes are wired to carry 220 volts.
T F 24. Never touch any electrical appliance when standing in water.
T F 25. A penny, when inserted behind the fuse, destroys the purpose of the fuse.

Metalwork Test

Encircle the letter *T* if you think the statement is true.

Encircle the letter *F* if you think the statement is false.

T F 1. Copper is used for war supplies and equipment.
T F 2. Files may be thrown into drawers with other tools.
T F 3. By hammering copper it is made hard.
T F 4. Dividers are used for drawing circles on metal.
T F 5. Tin snips is the name of the tool used for cutting thin metal.
T F 6. Tips of soldering irons are made of copper.
T F 7. Soldering irons can be overheated.
T F 8. Annealing is done by heating and then dipping into cold water.
T F 9. Copper cannot be stretched.
T F 10. Peening is a form of decoration in metalwork.
T F 11. The coping saw is used for the sawing of metals.
T F 12. Goggles should be worn at all times when grinding.
T F 13. The tool used for cutting steel rod is called a hack saw.
T F 14. The bar folder is used to make right angles in sheet-metal work.
T F 15. Emery cloth is the material used to polish metal.
T F 16. There is only one method of welding used today.
T F 17. Sweating is a method of soldering on patches.
T F 18. Good welders make rough beads when welding.
T F 19. Oxygen is used in acetylene welding.
T F 20. The same flux is used on all metals.
T F 21. Metal and wood files are identical.
T F 22. The bench stake is something that is driven into the ground.
T F 23. High speed drills are used in power drills for the drilling of metal.
T F 24. The center punch is used to center holes for drilling.
T F 25. Acetylene is used for both the cutting and the welding of metal.

Matching Questions

Place in the parentheses ( ) of Column II the number of Column I that matches.

I	II
1. bit	( ) boring mechanically
2. lathe	( ) used to measure diameter
3. calipers	( ) brace
4. hammer	( ) flathead bright
5. drill press	( ) tool used in making beads
6. mallet	( ) used with a chisel
7. f.h.b.	( ) equipment used for turning
8. skew	( ) roughing tool
9. rule	( ) used in cutting metal
10. gouge	( ) for sawing curved lines
11. frog	( ) part of the plane
12. snips	( ) for rubbing varnish
13. coping saw	( ) to saw parallel to the grain
14. pumice stone	( ) used to drive nails
15. ripsaw	( ) used to cut to required diameter
16. turpentine	( ) for flathead screws
17. parting tool	( ) measurement for nails
18. countersink bit	( ) laying out tool
19. dado	( ) used to thin paint
20. penny (D)	( ) common type of joint
21. rasp	( ) reinforced back
22. alcohol	( ) whetting plane iron
23. beam	( ) marking gauge
24. oilstone	( ) thin shellac
25. backsaw	( ) cleaned with a file card

Key

Woodwork	*Drawing*	*Electrical*	*Metalwork*	*Matching*
1. T	1. F	1. T	1. T	5
2. T	2. T	2. F	2. F	3
3. T	3. F	3. T	3. T	1
4. T	4. T	4. T	4. T	7
5. T	5. F	5. F	5. T	8
6. T	6. T	6. F	6. T	6
7. F	7. F	7. F	7. T	2
8. F	8. T	8. F	8. T	10
9. F	9. T	9. T	9. F	12
10. F	10. T	10. F	10. T	13
11. F	11. T	11. T	11. F	11
12. T	12. F	12. T	12. T	14
13. F	13. T	13. T	13. T	15
14. T	14. F	14. T	14. T	4
15. T	15. F	15. T	15. T	17
16. F	16. T	16. T	16. F	18
17. F	17. T	17. T	17. T	20
18. F	18. T	18. F	18. F	9
19. T	19. T	19. T	19. T	16
20. F	20. T	20. F	20. F	19
21. T	21. T	21. F	21. F	25
22. T	22. T	22. T	22. F	24
23. T	23. F	23. F	23. T	23
24. T	24. T	24. T	24. T	22
25. F	25. F	25. T	25. T	21

Problems and Projects

ARCHITECTURAL MODEL MAKING

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Architectural models can be used to great advantage in an advanced class of architectural drafting because the student has an opportunity to see just what he has been drawing in concrete form. His conception of the pitch of the roof, the shape of the dormer, the size of the windows and their spacing, all come to life in a pleasing mass that creates a lasting impression of what the house will really look like when it is built. The landscaping of the lot is also a revelation to the student and the instructor can give some pertinent suggestions that will be of a lasting value to the student when he comes to buy, build, or sell a home.

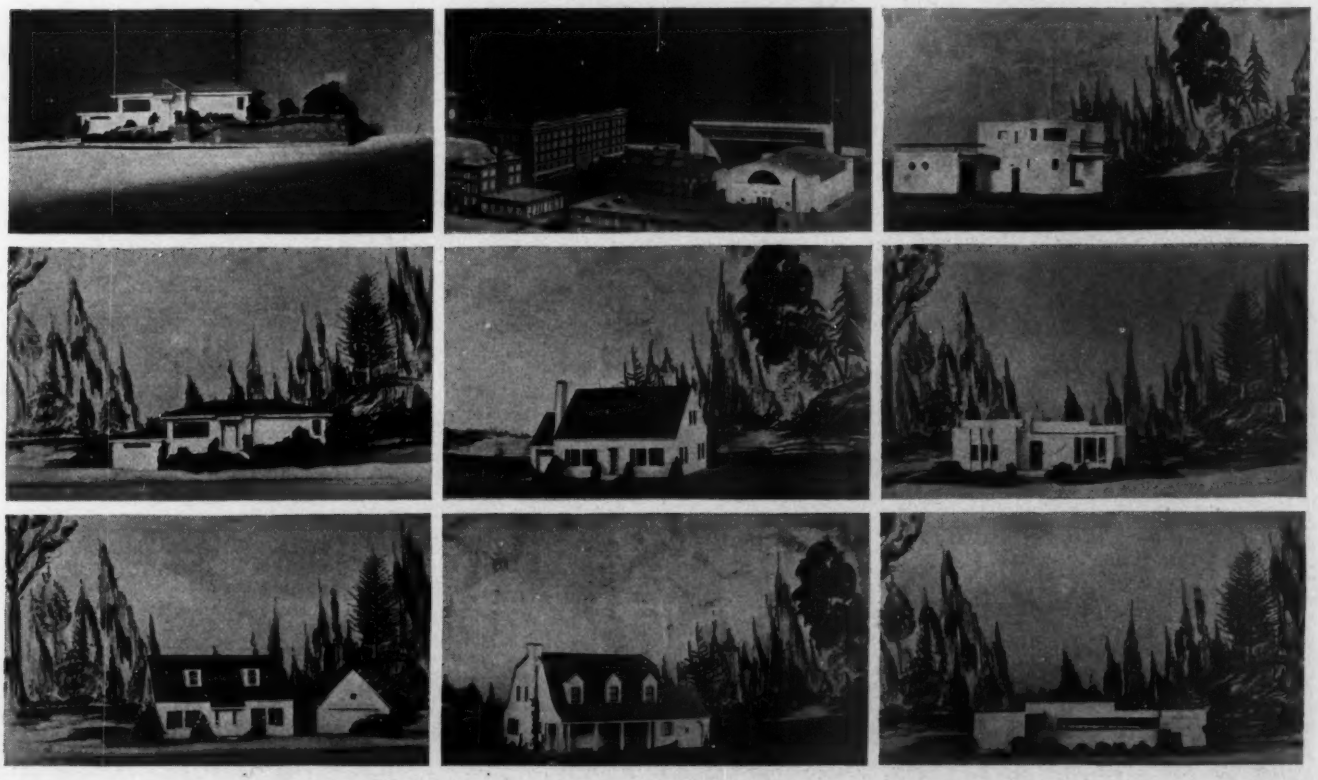
It has other values, in that the instructor can teach the beginner to learn to see things and to be able to appraise that which is good, and that which is ordinary or decidedly poor taste. The student becomes conscious of many flagrant errors in building, design and proportion, and the placing of a building, in regard to other buildings; he also can see what is good style and the many poorly designed houses that are being put up without regard to what is considered good. The fact that a monstrosity of lumber, brick, or stone has much to do with the renting of the building and also the resale of the building should always be considered.

The average individual pays little attention to what he is going to live in until the time comes for him to find a place for *her* and the *rest of the family*. Later on it dawns on him that he is up against the proposition of what to buy and what not to buy. The chances are ten to one that he will start a long series of payments on a house that will depreciate greatly in value over a period of 20 or 30 years, and at the end of the grind he will have a house that is entirely out of keeping with the trend. The real place to learn to know what is good, and what will always be good, is during his training in the early school days. If the student can have some training in building, drafting, and some practice in putting together a model, he has made some progress in the right direction. The student will even go so far as to criticize his own home, and many incidents have come to the writer's attention where a boy has saved his parents many heartaches in the building of a home, just through what he has picked up in school. It is most important that parents learn to see that it is not a question of money, but how the available money is used, whether they are contemplating the building of one room or a larger house. Good taste in homes is usually indicative of the training of the individuals and also a mark of proper training.

Architectural styles should be part of the education of boys and girls. But it is usually the drafting instructor that gives them their first introduction to its importance, and to the various accepted styles in common use today. The drawing of plans is interesting, but not as interesting as making a model, and students will never have to be urged to work if they experience the thrill of making a model. The rendering of a perspective and the making of the model is a fitting climax to all of the work that is necessary in preparing the plans.

The photographing of a completed model in several positions or angles will complete the modeling process and gives the student some valuable ideas in planning a building. The writer has used a set of 2 by 2-in. slides in lectures on styles and some of the models that were made were used with a very pleasing effect. In fact, some of the slides, made from models, could not be told from the real building. It is a sure way to tell what is good and what should be changed for the better.

Model making does not cost much. Many of the completed models actually cost from 50 cents to $1. Any student with ordinary mechanical ability can develop the required skills in making a model from the drawings that he has completed in his architectural



Models made by students attending the author's classes

drafting classes. The work of building a model is very interesting, and with a little practice a beginner in model making can construct a very charming model from the scaled drawings that he has drawn. The time that is required will usually run well into 90 to 100 hours, but the instructor can rest assured that he will not have to prod the student in order to keep him working. Parents are very much interested in this type of work because many of them are thinking in terms of a home, dollars, and cents. They want to know, ahead of time, just what the home is going to look like when it is finished. Color schemes can be determined also at this time, and changes made accordingly. Landscaping will come in for its part in the layout of the model, and the decision of what type of lot to put it on is generally given consideration at this time. A camera study of the model will clinch any misgivings about the size, shape, and color, and changes are more easily and cheaply made at this time than when the house is actually built. Many large architectural firms make scaled working models of residences, community layouts, industrial schemes, etc., and during the present defense preparations, huge models are made in advance, all of which indicates that the learning of making a model is practical and is the current trend in building construction.

The next thing to decide upon is the materials that are to be used in making models. Beaverboard, Strathmore board, or any good white, stiff cardboard that will stand up and not warp out of shape easily, is used generally. The writer has found that a good ¼ or ⅛-in. beaverboard is ideal for general use, and has practically discarded using other types of boards on the market. The windows may be made of thin celluloid, or a tracing vellum with the lines on the material to indicate the muntins, check rails, and stiles. With this scheme for windows it is easy to use lights in the model, and the use of celluloid gives the window the natural depth and appearance of the windows in houses that we see all around us. One can also use thin projection slide glass and paint the markings or glue on cutouts for the rails, muntins, and stiles, etc.

The exterior walls are usually in brick, stone, shingles, siding, or stucco. Brick can be painted on the walls with an Esterbrook or a Paysant pen filled with water color or colored ink of the desired shade (reddish brown), or one can paint the brick on the walls with a sign or show-card brush of the correct width of the brick. By drawing a few faint horizontal lines here and there for guide lines and painting with care, a very realistic piece of brickwork can be made on the walls, all of which should be done before the sides of the house are assembled. One should experiment on a sample with the correct tool and medium for the best results.

Siding should be accurately glued on piece by piece and work of this kind requires great care to do an excellent job. A good grade of drawing paper is necessary so if there is any painting to be put on later it will stand up without buckling all out of shape. White paper is preferred.

Shingles are put on in strips also, but of course they should be staggered on each course to break the joints. Shingles are made by cutting about a hundred strips of white or colored paper about three quarters of an inch wide and about 12 inches long. These are all stacked accurately between two pieces of ¼ by ¾-in. board the same width as the paper, and then they are nailed together here and there in the center mostly to hold the paper in line. The next thing is to cut the shingles about every one-quarter inch and a quarter inch deep on both sides of the strips. This should be done with a fine jig saw so the cut will not be too wide. One should always remember to keep all things in the same scale, even to trees and bushes, etc. Many models are ruined by ignoring this important fact. When attaching the shingles, start at the cornice or eaves and glue them on strip by strip and be sure that they are put on even and straight. Rubber cement seems to be the best glue to put on shingles and siding, and all the surplus can be removed just by rubbing it off with the fingers. The roof is made of ¼-in. beaverboard or a stiff 1/16 or ⅛-in. cardboard.

Chimneys may be made out of cardboard or out of a solid block of wood, painted to resemble brickwork or stucco. Dormers are usually made after the roof is put on, and they are made up and assembled and glued on in their proper position. This seems to be the easiest way, and most of the accessories for the entrance porch or a side porch may be made up after the main part of the house has been completed. The student should keep in mind that it is necessary to keep all walls straight, plumb, and square, and that the windows are level; in fact, just the same as they would be if they were put in the real house by the mechanic. The smaller the model the more accurate the work must be, because the inaccuracies are very easily detected by the human eye at such small scales.

The tools needed are a sharp knife, razor blades, tweezers, saws, chisels, mallet, pliers, small square, small clamps, small hammer, pens, brushes, etc. Materials required are usually beaverboard, cardboard, white drawing paper, water colors, water crayons, textolite, textone, plaster of Paris, glue, rubber cement, brads of various sizes, and other supplies of this nature.

Assuming that you have made the plans previously, or if not it is necessary to have four elevations and a floor plan drawn to the same scale as that used for the proposed model. One-quarter inch scale, and one-eighth inch scale are used mostly. In large models it is necessary to resort to a much smaller scale. The beginner should use the one-quarter inch scale to start with.

Trace or transfer the four elevations on the beaverboard, including the location of all windows and doors. Saw out the four elevations accurately and then cut out the window and door openings with a chisel. These may be also sawed out with a jig saw and later filed out smoothly. Next, cut out the dormers, and their window in the same manner. A vestibule or a wing is done usually as a separate unit, as is also the roof. One should break up the house into units if possible, and construct them one by one, and then assemble them according to the drawings. A little study in advance will save some extra moves later on. The best way seems to miter all corners and glue them together with a good glue. For greater strength, fasten them to a ½ by ½-in. strip with ½-in. brads. Be careful to assemble all parts at right angles. It is recommended that a series of strips be nailed and glued to the floor plan drawn on a piece of waterproof ½-in. plywood to which the walls of the house may be then fastened.

Such accessories as shutters, offsets, and even minute projections should be in scale and very accurate. The projections of the cornice, and the indenting of the doorways, and many other details must be true, to construct a model as it should be made. The indenting of the windows, and the projection of sills are quite noticeable to anyone, and it is these little details that go to make up the house as it would look when it is actually built.

The painting should be done carefully, also putting on the stucco should have a realistic appearance, which can be done easily with a small trowel, putty knife, or some similar tool, and then brushed, leaving the brush marks. Textolite is an ideal material for stucco or for representing stone. When marking out of the joints in the stonework, a touch here and there with a delicate shade of water color will give the desired colors or tone to the masonry. Flagstone walks can be put in very true to life with this method. Don't overdo the making of joint; if in doubt about the joint, look up a flagstone walk and see just how it is in actual work. There are some plastic paints that will give the same effect as textone or textolite. One can get the plain textolite and paint it with a water-color paint, or it comes in some very excellent pastel shades ready for use. In putting on water colors, there is a tendency to get the colors too intense which should be carefully planned in painting the stucco.

The windows can be made up in advance with celluloid, gluing some strings on for the muntins, and a cutout of the stiles and rails is made and glued to the celluloid; then they are glued to the inside of the walls of the house. This may be done while the walls are being prepared or they may be put in after the walls are assembled. It is easier to do it before, however.

For the landscaping select some sponges of various textures and then dye them and cut them to shape with a pair of scissors. Rubber sponges are not very desirable except for a boxlike hedge of the modern cuttings. Human figures can be cut out of a small piece of wood, but be sure they are to scale. Lawn furniture should be planned carefully and placed in the lot with some thought. Automobiles can be purchased at the five-and-ten stores, and here again, measure them up to be sure they are in the same scale as the model. For hilly or rolling ground one can build up the land with wire lath over blocks of wood and then add plaster of Paris to finish up the main contour of the land. To this add the textone, and lift or rough it up to resemble grass with a stiff brush, and when thoroughly dry, paint with a dull sap green paint. Above all, don't use shiny paint on a scale model.

A small hole about 2 by 3 in. cut in the plywood will allow room to put in a small lighting bulb. Several models can be lighted by a set of Christmas lights, creating a very attractive assembly.

To see how the model will look, it is suggested that a photograph be taken of it at various angles, and if one can, it is well to sketch in a background in blue or green crayon to represent a more realistic piece of work and it will help materially to give the picture depth. If possible, a Kodochrome should be made, and if this is done the background can be in the actual colors, but they should be sketched in to scale, and in a soft pastel crayon.

The pictures presented are of models made at The Stout Institute in classes of architectural drafting. Care has been used in selecting models that are the results of national competitions, and most all are of an accepted style, which helps greatly in getting the student to think in terms of style and not to what he is accustomed to seeing in his neighborhood. Through this medium the student becomes more observing and can in a short time appreciate what is good and what is more or less questionable.

ANIMALS AND DRUMS FROM INNER TUBES*

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Many interesting and worth-while objects can be made from so-called scrap materials. Rubber inner tubes, which are adaptable to a variety of uses, fall into this class of materials. The animals in the accompanying illustrations are made from dark red inner-tube rubber, decorated with India ink. This type of toy seems to be most interesting to, and therefore, most successfully made by children in the third through the sixth grades. Suggestions for animals suitable for different age groups can be gotten from project sheets and children's books.

In the construction of rubber animals, the first step is to have each pupil draw a pattern of the animal that he wishes to make. After the outline pattern is drawn and cut out, patterns for the ears, tail, tongue, and the like, are also sketched and cut out. These are then tested on the outline pattern for appearance. If the body and detail parts are well proportioned and fit together well, they are then ready to be traced on the rubber.

*If and when they are again obtainable.

FIG. 1

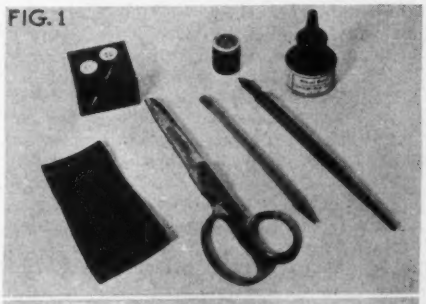

FIG. 2

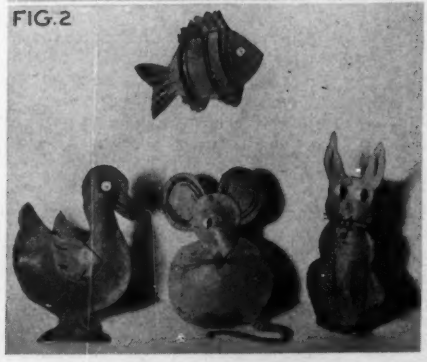

Fig. 1. Materials and tools used for making articles out of inner tube rubber
Fig. 2. Animals made from inner tubes

If certain preliminary operations are performed on the inner tube first, the work of tracing and cutting will be comparatively easy. First, take a pair of strong scissors or tin snips and cut the valve out, then slit the tube down the center. The patterns may then be laid on the tube and traced with a soft pencil, a nail, or a piece of chalk. Care must be taken that all pieces are so cut that when fastened together the outsides will all be of the same finish or texture. When all are cut, the rubber pieces are placed in their correct relation to each other and the edges are given a final checking to make sure that they fit perfectly. The features and lines of expression are sketched in lightly with a pencil, and the button eyes are sewed on. Most children prefer a toy that will stand alone, and this can be accomplished very easily by cutting a rubber bottom or foundation for the toy. See the rabbit in Figure 2.

The third step in making projects of this kind is very important, for on it depends the durability and finished appearance of the toy. The rubber pieces may be put together in either of two ways: they may be cemented together, or they may be sewed. Sewing seems to work especially well in the lower grades. If cement or glue is used, care must be taken that the adhesive is applied evenly and that the edges contact firmly until dry. The animal may then be stuffed with cotton or kapok, the bottom fastened on and the ears, tail, tongue, and other parts, either applied flat or fastened in slits made in the body, and the decorative markings gone over carefully with India ink.

Another very satisfactory use for rubber is in the construction of small drums, or the reinforcement of boughten ones.

Drums for small children are easily made by drilling a hole in the bottom of a wooden chopping or fruit bowl, cutting a circle of inner tube about 4 in. larger than the top of the bowl, and then tacking this circle tightly across the top and down the outside of the bowl. Older elementary children can make very satisfactory drums for their rhythm class by securing large round tin cans such as are used for oil, paint, or potato chips, and cutting out the ends. A nail keg also may be used. The outside of the can or keg is painted a solid color and left to dry. A decorative design is worked out on paper first and then traced on the can, painted on, and allowed to dry. Next, two circles of inner-tube rubber 6 in. larger than the top of the can are cut. Perforations, about 2 in. apart and 1 in. from the edge, are then punched in the rubber circles. A rubber circle is then placed over each end of the drum cylinder and laced together with a heavy cord or leather thong run through a perforation first in one end, then in the other, until the entire two rubber circles are laced down tightly. This method was used by the Indians.

The life of ordinary inexpensive wooden practice drums can be lengthened considerably, and their tone improved a great deal also, by simply cutting a small 3 or 4-in. circle of rubber and cementing it to the drumhead.

In the types of projects outlined in the foregoing, the cost of materials is negligible. It is ingenuity and workmanship that will count in the final results.

CANTEEN MADE FROM FILM CONTAINER

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With sheet metal almost unobtainable, the choice of projects for the metal shop becomes quite a problem. Most boys can use a canteen and will like to make one. A very nice job can be made at little cost to the boy by using containers for 35mm. film. This film is used in great amounts by many firms and the cans are thrown away when empty so that they can usually be obtained by the boy at no cost.

The inside of the film can is given a coat of waterproof finish to keep it from rusting

Canteen ready for use

The inside of the can should be rust-proofed since the tin coating on the can is very thin. This can be done by coating with solder or by using a waterproof enamel. An opening for the neck is cut and then the two halves of the can are soldered together. Regular screw tops are still available from sheet-metal supply houses, or one can be cut from a discarded container. D rings are soldered on with tin straps so that a carrying strap may be attached. An insulation should be made to keep the water cool. This can be made of heavy blanket if nothing else is available. This covering can be fitted with snap fasteners or buttons so that it can be removed when desired.

GLUING WOOD

LOUIS BAROCCI

High School

Cudahy, Wis.

The use of glue in the fabrication of wood products brings about more complete utilization of timber through the use of lower grades, inferior species, and small sizes of material; it conserves supplies of clear material and of the scarcer and more valuable woods; and it makes possible a saving of material in the production of articles of unusual form, dimensions, and properties. Nearly every article of glued wood construction represents an economy in the use of timber resources.

Glues Used in Woodworking

The adhesives discussed in this article belong to five classes, namely: animal glues, liquid glues, vegetable (starch) glues, casein and vegetable-protein glues, and blood-albumin glues. There are various other adhesive substances including silicate of soda, mucilages, pastes, rubber cements, cellulose cements, phenol-aldehyde compounds, asphalts, gums, and shellac, some of which are used for gluing wood; but also only the five classes already mentioned, are discussed herein.

Animal Glues

The desirable properties of animal glue for woodworking are high strength, free-flowing consistency, quick setting, stainlessness, and adaptability to different use conditions. In practice no other glue has been found to be as satisfactory as animal glue for hand spreading on irregularly shaped joints, although a cheaper glue would be very desirable. The cost of animal glue and the precautions necessary in applying it are the chief factors which limit its use. For some purposes the fact that it is not naturally highly water resistant is also a drawback.

Animal glue may be obtained in different forms, of which the sheet, flake, and ground forms are the most common. Shredded and pearl glues are two forms more recently developed. There is no distinguishable difference in strength or other property between these forms. Ground, pearl, and shredded glue can be mixed and melted more quickly and conveniently than the others, but some consumers avoid the ground glue because they consider it easier to adulterate. While adulteration is possible, ground glue which conforms to acceptable specifications or standards may be used with confidence. Most of the animal glue used in woodworking is made by cooking in water the hides or bones of cattle, but some is made from fleshings, sinews, cartilage, horn piths, and other animal parts, and the liquid thus obtained is drawn off, concentrated by evaporation, jellied, and further dried. The same raw material, with fresh water added, is reheated to yield liquids for other batches of glue. The first batch of glue gives the highest grade. There is also a wide range in the grade of glue obtained from each class of raw material.

Liquid Glues

Of the large class of glues sold in liquid form a high percentage are made from the heads, bones, skins, trimmings, and swimming bladders of fish, and the whole class is often referred to as fish glues. Some liquid glues, however, are made by treating animal glue with a chemical agent, usually an acid, and some are made from other raw materials. The relative merits of the glues made from these different materials have not been thoroughly studied.

Most liquid glues are similar in properties to animal glues. Only the best liquid glues, however, are reliable enough and make strong enough joints for use in wood products. The ability to make strong joints is generally indicated by the viscosity or "body" of the glue, thick glues giving high strength and thin glues low strength. A desirable property in a liquid glue is that of remaining in workable condition as long as it is in the container, but drying and setting quickly on wood surfaces.

Liquid glues are commonly sold in small containers under various trade names, without other indication of grade or quality. Their chief advantage is that they come in prepared form, ready for immediate use which makes them particularly suitable for patchwork and small gluing jobs.

Casein and Vegetable-Protein Glues

Casein glues have only recently been used in the woodworking industry in the United States, although they have been known here since about 1873, and have been used in Europe in bookbinding and cabinetwork for a much longer time. World War I greatly stimulated the use of these glues in America. When airplanes were first manufactured in large numbers, requiring water-resistant members of plywood and laminated construction, a wide and important field was opened for casein glue, and its use has since expanded in other industries.

Casein glues are made by mixing water and certain chemicals with the casein obtained from milk. They are often referred to as glue cements, because when allowed to set they become entirely different in properties from the original mixture and most of them cannot be redissolved by water.

The main advantage of casein glues is their high water resistance or ability to retain strength when wet. Casein glues are mixed and used cold. The better casein glues produce joints which are adequate in strength for most woodworking purposes.

Among the disadvantages of casein glues for certain uses are their dulling effect on tools, their tendency to discolor certain woods, their relative short working life, and their high viscosity. All strong glues dull the knives of woodworking machines to some extent in machining a joint after gluing.

Many highly water-resistant casein glues are especially bad in this respect. The dulling effect of a glue line on knives is also affected by the thickness of the glue film in the joint. The tendency to stain has been reduced in the case of some special casein glues, but experience with such glues indicated that the properties of nonstaining and high water resistance have not yet been combined in the same casein glue. The high viscosity of casein glues makes them inconvenient to spread by hand unless a special brush is used or the glue is mixed thinner than is customary.

Casein, the principal ingredient of casein glue, is the prepared curd of milk. When obtained as the product of natural souring it is known as self-soured or lactic-acid casein. It may also be precipitated from milk by sulphuric and hydrochloric acids. The general methods of preparation is to remove the acid and other impurities from the curd by washing and then to dry and grind it fine enough to pass through a No. 20 mesh or finer sieve. Variations in detail of the process yield caseins of somewhat different properties.

Besides casein and water, a third principal ingredient of most casein glues is hydrated lime, which reacts with the casein to form a high water-resistant compound. A properly proportioned mixture of these three substances will give a strong, water-resisting glue. Such a glue, however, will remain in workable condition only a short time.

To lengthen the working life of the glue a fourth ingredient is added. Trisodium phosphate, sodium fluoride, sodium silicate, sodium hydroxide, copper sulphate, and copper chloride also have been used for this purpose in patented formulas.

Casein glues are classified as *prepared* and *wet mix*. Prepared glues can be bought in the form of a powder containing all the dry ingredients and requiring only to be mixed with water. Wet-mix glues are made up by the user from the several raw materials. A number of formulas for wet-mix glues have been developed by the Forest Products Laboratory and some have been published. The use of prepared glues requires less technical skill than the use of wet-mix glues, although a standard procedure for the wet-mix glues can be acquired with a little practice.

Soybean and Peanut-Meal Glues

Vegetable-protein glues originated on the Pacific Coast and are used extensively in the plywood industry of that section. Of the large class of protein materials the soybean and the peanut meal are typical representatives. Their gluemaking properties are more analogous to those of casein glue than to those of starch glue. In preparation and use, the good quality soybean and peanut-meal glues are similar to the casein glues. They are cheap, but have not yet proved to be entirely satisfactory for gluing all kinds of wood.

Preparation of Glues for Use

A standard procedure should be adopted in preparing glues for use. This involves such details as the amount of water to be added, method of combining glue and water, and time of mixing. A standard procedure gives a more uniform mixture and avoids too much reliance on the individuals who do the mixing. Clear, cold water should be used with all glues. The quantity of dry materials and water should be accurately determined by weight. The correct proportions of glue and water vary for different kinds of glues, woods, types of joints, and conditions under which the gluing is done.

For most glues used in woodworking the proper amount of water varies from 1½ to 3 parts to 1 part of dry glue by weight. With a given glue the amount of water used should also be less with porous woods, end grain surfaces, or where high joint strength is desired, than with nonporous woods, side grain surfaces, or where high strength is not required. A glue mixture with a large proportion of water gives a large spread and is in a satisfactory condition for pressing a long time after the spreading. The mixing should be done in such a way as to produce

a solution of uniform consistency relatively free from air bubbles and particles of undissolved material.

As the water is added to the dry animal glue the mixture should be stirred thoroughly. The mixture should then stand in a cool place until the glue is completely water soaked. The softened mixture should then be melted. Shredded glue will soften in a few minutes; ground glue in an hour or less; and sheet glue will sometimes take several hours, according to the size of the cakes. Of the many types of melting pots in use, those in which the glue flows away as soon as melted or in which the temperature of the mixture can be accurately controlled are preferable.

The temperature at which animal glue is kept liquid has much to do with its quality. A temperature of 140 degrees F. is the most desirable. It is not usually practicable, however, to maintain exactly this temperature when commercial gluepots are used. In any event a temperature range between 140 degrees and 150 degrees should not be exceeded. At temperatures lower than 140 degrees, decomposition of the glue caused by bacteria or other microorganisms may set in, and at temperatures higher than 140 degrees, the deterioration of the glue from chemical action is hastened. Numerous tests have proved that both high temperatures and long continued heating, even at temperatures lower than 140 degrees, reduce the strength of animal glue.

Deterioration of Animal Glues Caused by Microorganisms

Decomposition by bacteria is a well-known cause of serious trouble with animal glue. The bacterial action is usually accompanied by a characteristic offensive odor and rapid deterioration. Decomposition takes place rapidly at high room temperatures, and "sweet" glue in contact with infected glue soon becomes "sour." The utmost cleanliness should, therefore, be the rule in handling and using animal glue.

Preparing Casein Glues

A *prepared* casein glue is mixed by simply stirring the prepared dry glue into water. Most glues require about 2 parts of water to 1 part by weight of dry glue. An additive or subtractive variation of 10 per cent in the amount of water is allowable for different kinds of work. The water should be poured into the bowl of the mixer first and the glue sprinkled or sifted in slowly while the paddle of the mixer is at high speed (100 to 120 revolutions per minute). Care should be taken that no large lumps are permitted to form. After the dry glue has all been added, the stirring is continued at half speed until a smooth, thoroughly dissolved mixture of even consistency is produced. This ordinarily occurs in 15 to 30 minutes. With a few glues the dry powder is mixed with the water and then allowed to stand, without agitation, until the materials are dissolved.

The working life of mixed casein glues may vary from less than an hour to several days, according to the formula used. Most casein glues become noticeably thicker on standing at room temperatures, and the quality of joints made with such glues appears to be unaffected so long as they can be spread satisfactorily on the wood. Casein glues that remain liquid for a day frequently become thinner, which generally indicates a deterioration of the mixture. Glues that have thinned appreciably should, therefore, be used with caution. Glue mixtures that will remain liquid, even though used just after mixing, do not produce joints of the highest water resistance.

Preparation of Wood for Gluing

The moisture content of wood for gluing should be such that when increased by the moisture from the glue it will be as near as practicable to the average moisture content of the finished article. Moisture changes in glued wood induce stresses which favor warping and checking. These stresses reduce the strength of glued joints and should, therefore, be avoided as far as possible.

The range of moisture content of dry wood in service commonly varies from 4 to 15 per cent or more, depending mainly upon the humidity to which the wood is exposed. The wood in a chair may have as low as 4 per cent moisture in the same room in summer. The average moisture content of wood in heated buildings is about 7 per cent for the year. Dry wood out of doors has an average of about 12 per cent moisture throughout a large part of the United States but will average less in areas of low humidity and more in areas of high humidity.

The amount of moisture added to wood in gluing varies from less than 1 per cent in lumber of 1-in. thickness to 45 per cent in thin plywood where the amount of wood is small in proportion to the amount of glue. The thickness of the wood, the number of plies, the density of the wood, the glue mixture, and the quantity of glue spread all affect the increase in moisture content of the wood that is being glued.

Lumber with a moisture content of 5 or 6 per cent is satisfactory for gluing into furniture and similar uses. Lumber for outdoor purposes, however, should generally contain about 10 per cent of moisture before gluing. The moisture added in gluing will then bring the total moisture to about 12 per cent.

Machining Lumber

Careful machining of lumber is necessary in the preparation of wood for gluing. The wood surfaces should be machined smooth and even. In panel work the pieces should also be machined to a uniform thickness. It is customary to machine the wood just prior to gluing so that the surfaces will not have an opportunity to become distorted from subsequent moisture changes. Where the four sides of a piece are to be glued it is best to do the gluing in two operations, and machine just before each operation.

Machine marks caused, for example, by feeding the stock through a planer too fast for the speed of the knives, prevent complete contact of the joint faces when glued.

Spreading Glue

It is safer to spread an excess amount of glue than to spread too little, for if too little is spread the joints may be weak. More of a thin glue than of a thick glue is absorbed by the wood and is squeezed out under pressure; hence, a heavier spread is required for thin glues. Absorbent woods take up more glue than less absorbent woods and must, therefore, receive a thicker glue spread. Rough surfaces require more glue than smooth surfaces, and poorly fitted joints more than closely fitted joints.

In most commercial gluing, only one of the contact faces of a joint is spread (single spreading). However, when precautions are taken to insure strong joints, both faces are sometimes spread (double spreading). Tests at the Forest Products Laboratory using both methods have shown that in gluing flat surfaces there is no significant difference in the strength of joints made by these two methods under good gluing conditions. Under adverse gluing conditions, however, such as when the glue on the wood becomes thick before pressing, double spreading is more reliable.

In gluing wood, pressure is required to bring the surfaces of the joint into contact, to force the air and excess glue from the joint, to spread the glue into a thin film of approximately uniform thickness, to force the glue into the wood cells which are adjacent to the glue line, to hold the joint in correct position while the glue sets, and to prevent warping. Duration of pressure should be from 10 to 18 hours.

Amount of Pressure

It is possible to make well-glued joints with pressures which range from a few pounds, such as are exerted on rubbed joints to 1000 or more pounds per square inch.

SERVICE HONOR PLAQUE

EMIL F. KRONQUIST

Milwaukee Vocational School

Milwaukee, Wis.

Schools, industrial plants, commercial establishments, churches, and clubs — all these have their honor rolls in days of war, and rightly so. Often the list of names is long, and more names are added daily.

The honor plaque shown here was designed with that point in mind, taking into account, also, the difficult question of available materials.

Symbolism is used throughout. The global war: the wide band stretching around the world with the insignias of our armed forces — the army, the navy, the marines, and the coast guard. Civilians not professionally in the army or navy are represented by the red cross. The flaming torches symbolize what we are fighting for — freedom, light, and knowledge.

Our gallant air corps is not a separate branch of our armed forces, as there are flyers in all our branches of endeavors, military and civilian. The space below the central band where the *W* is shown can be used for the school seal, or trade mark, or initials of the firm. The sentiment expressed on the lower rectangle, of course, may be of individual choosing.

The over-all size is 28 by 33 in. The globe is 24 in. in diameter, and the American eagle on top has a wing spread of 16 in.

There are many ways in which this plaque could be made. First, a full-size drawing should be made and studied.*

1. The entire plaque should be sawed out of a piece of ¼-in. hard masonite. This may then be painted in various shades.

*A blueprint 33 by 40 in. may be had for $1.50 by writing to The Bruce Publishing Company, Milwaukee, Wis.

2. The globe is cut out of ¼-in. hard masonite with the longitude and latitude lines cut with a veining tool or scratched deeply with an awl. The equatorial strip should be cut out of ⅛-in. masonite. The insignias should be cut as silhouettes from thin metal with a jeweler's saw. The eagle and torches would have to be carved.

3. A blue mirror with ½-in. bevel, longitude and latitude lines etched, and holes drilled for the trimmings may also be used for the globe. The equatorial band should be a strip of yellow brass, No. 22 B and S gauge, with ¼-in., half-round beading along the edges. The insignias may be embossed in repoussé,

Service plaque designed and drawn by Emil F. Kronquist

or cut in silhouettes with the lines chased. A white metal, as sterling silver or aluminum, on brass makes a pleasing combination of colors. The eagle and torches must be modeled or carved and plaster casts made from same. Roman letters can be purchased from a pattern supply house and shellacked to the plaque.

A separate name panel, similar to the kind used for directories in office buildings, where names can be added, is suggested as a unit to be placed below the plaque.

AN EXPERIMENTAL 220-VOLT THREE-PHASE MOTOR

HENRY A. BANKHARD

Senior High School

Hagerstown, Md.

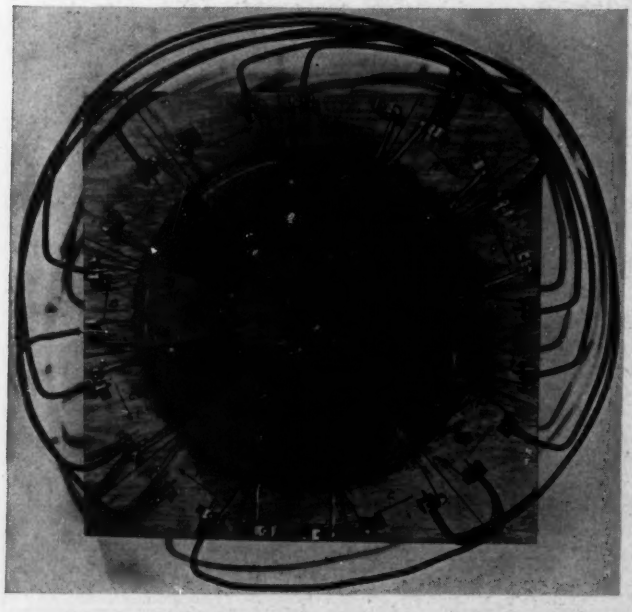
The experimental 220-volt, three-phase motor described herewith fulfills a long felt need for a practical method by which the student may make the various connections necessary to the proper operation of the three-phase induction type. While the motor is of no value as a source of power, its construction is similar to that of a larger, more capable machine.

Stated simply, the motor consists of a group of 36 coils arranged so as to be easily and efficiently connected in any one of the common types of three-phase connections. Above these coils a typical squirrel cage rotor is supported on a shaft by a bearing so as to be free to turn under the influence of the poles.

Construction details may be changed to make the best use of immediate materials at hand, but the electrical design must be more or less consistent.

The magnets, or pole coils, are wound on cores made of laminated or thin wire iron stock. These cores are 2½ in. long and ⅜ in. in diameter and are fitted with fiber disks placed ¼ in. from each end. These disks are made of ⅛-in. stock, are 1⅛ in. in diameter, and are drilled to accept leads and core. Before winding, the iron core must be insulated with tape or some sort of insulating paper to prevent shorts and grounds. The coils may be wound on a coil winder or by the familiar hand drill method. The magnet wire used is No. 32 single enamel, and may be salvaged from the electromagnet of an obsolete radio speaker. Each core should be filled with wire, and the actual number of turns in each coil should be reasonably close to that of the other coils. This will insure an even magnetic pull in the finished motor and will help keep the rotor magnetically balanced. Finished coils should be protected by a coating of varnish and an external layer of insulating paper or tape. Shellac should never be used on enameled wire because the alcohol in the shellac dissolves the enamel. The coils are mounted in a circle on a piece of ¼-in. plywood, as shown in Figure 1. They are staggered to keep the circle relatively small. Leads are brought out to connection posts, and the series connections are soldered in place. It might be noted that three coils make up one-pole phase, and there are 12-pole phases in the job. A circle of plywood is drilled and mounted over the top core ends of the coils. A few long wood screws hold this plywood in position. This precaution prevents the coils from becoming loose in their places and also aids in their protection. The black and white stripes on the top disk, as shown in Figure 3, indicate polarity. The actual connections are brought out to Fahnestock clips to allow for easy connecting. Connectors or jumpers and leads are made of No. 14 house wire in length and variety to make any possible connection. The rotor is of heavy gauge metal and is so constructed that the *teeth* are positioned between the poles of the stator. Usually there should be more rotor teeth than stator teeth. The rotor shown in Figure 2 contains 48 teeth.

Fig. 3. A view from the side, showing the position of the coils, the lead terminals, and other construction details



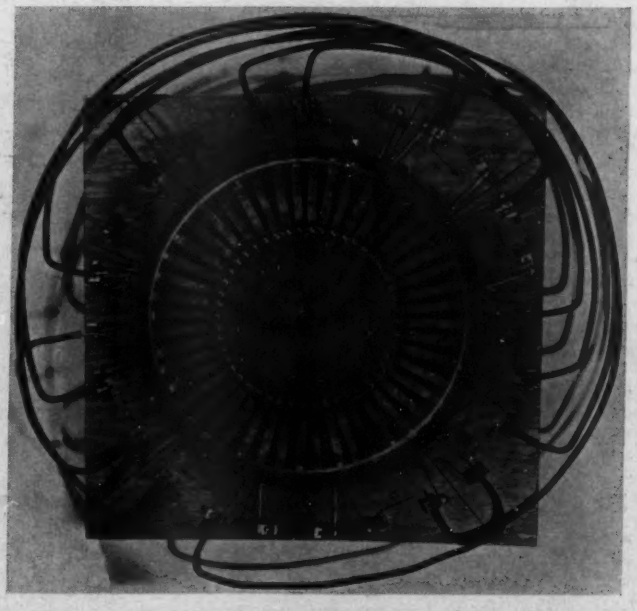


Fig. 1. (Left) A view from the top of the partially connected motor showing the top coil ends and the rotor supporting shaft. Fig. 2. (Right) Same as Fig. 1, but with rotor in position

The actual construction of the rotor might be left to the devices of the reader, but the neatest and best rotor can be made by piecing strips of iron from a center of heavy gauge metal in the form of a fan. The extreme outer ends of the strips are soldered to a circle of brass or copper, and the inner ends soldered to the disk. Thus, the rotor, or secondary, is properly short-circuited. These rotor strips are 5/16 in. wide and the rotor should be designed so these strips are positioned over the poles, as indicated in Figure 2.

The outside race of a small bearing is mounted and soldered to the center of the rotor, and the inner race fitted to a supporting shaft by a press fit. The motor must be well balanced to eliminate troublesome and excessive vibration.

Just a word about the electrical characteristics of the circuit. The coils have been wound on an open end core. Consequently there is very little impedance, and the circuit depends almost entirely on the resistance of the winding for reduced current flow. In the single circuit *Y*, or star connection, we have a circuit having the most possible resistance and connected across the lowest possible voltage. With this hookup the motor can run almost indefinitely without heating, but this cannot possibly be the case for other two-circuit connections. Therefore, it is necessary to add a resistance of about 1620 ohms in series with each of the line leads when using any two-circuit connection. A 220-volt, 25-watt bulb connected in the line works out very nicely for this resistance, and the bulbs are inexpensively obtained. So long as the current is held down to 0.2 amps in single circuits, and 0.4 amps in parallel circuits, the motor is in no danger of a burn out. By the very fact that this motor is more of a resistance winding than an impedance winding, there is no harm done if a pole or phase is reversed.

The motor will *not* run at full speed since the design has not allowed for efficiency in operation, but, when connected properly, the rotor will turn rapidly (about 900 r.p.m.).

In the event of a reversed pole phase or half a phase open, the motor will develop a heavy phase hum, and if it is single phased it will not run. However, under normal conditions the operation of the motor is almost noiseless.

Whittling-Jackknife Technique

W. BEN HUNT, Hales Corners, Wis.

(*Continued from page 37 of the January, 1943, issue*)

A Set of Whittled Chessmen

Nearly all chessmen are either turned on a lathe, or they are cast. The very expensive ones are carved or whittled.

It is not a very difficult task to whittle a beautiful set of chessmen with a small bladed knife that has been properly sharpened. The job can be finished readily in a few evenings.

The first thing to decide is whether the men are to be made of softwood or of hardwood. Since the pieces are all small, and since they do not require so much work, it may be well to choose hardwood, so that continued use will not nick and dent the chessmen so easily. Birch or maple may be used for making the white men, and walnut or mahogany for the black men. To make the one set still darker a coat or two of walnut stain may be applied.

Of course, all of the men may be whittled out of birchwood, and then the one set may be painted with two coats of flat black paint. The final finish may consist of several coats of clear varnish or lacquer.

If made of softwood or of basswood, the whittling will take less time, and they will be quite serviceable too.

The simplest way to start is to cut strips of wood to octagonal shape on the circular saw. These pieces should then be planed with a sharp plane. About 2 ft. of the 1-in. stock and 2 ft. of the ⅞-in. stock will be used for each color. This will allow for some spoilage too.

Mark off the divisions and whittle to the shapes shown in Figure 110. The eye will quickly detect whether the cuts have been correctly made. One who has done little or no whittling should try to make a few trial cuts, going all the way around the stick. It is really surprising how easy the whole thing is and how quickly one can learn to do it. Be sure to have the bottoms squared off properly. Cut all blanks to length with a power saw, or in a miter box, before starting the job of whittling. The bottoms also may be squared off on a sanding disk. Be sure that they all stand properly or you will be disappointed when they are finished and then it will be a lot harder to get them to stand straight.

Finishing them is a matter of personal

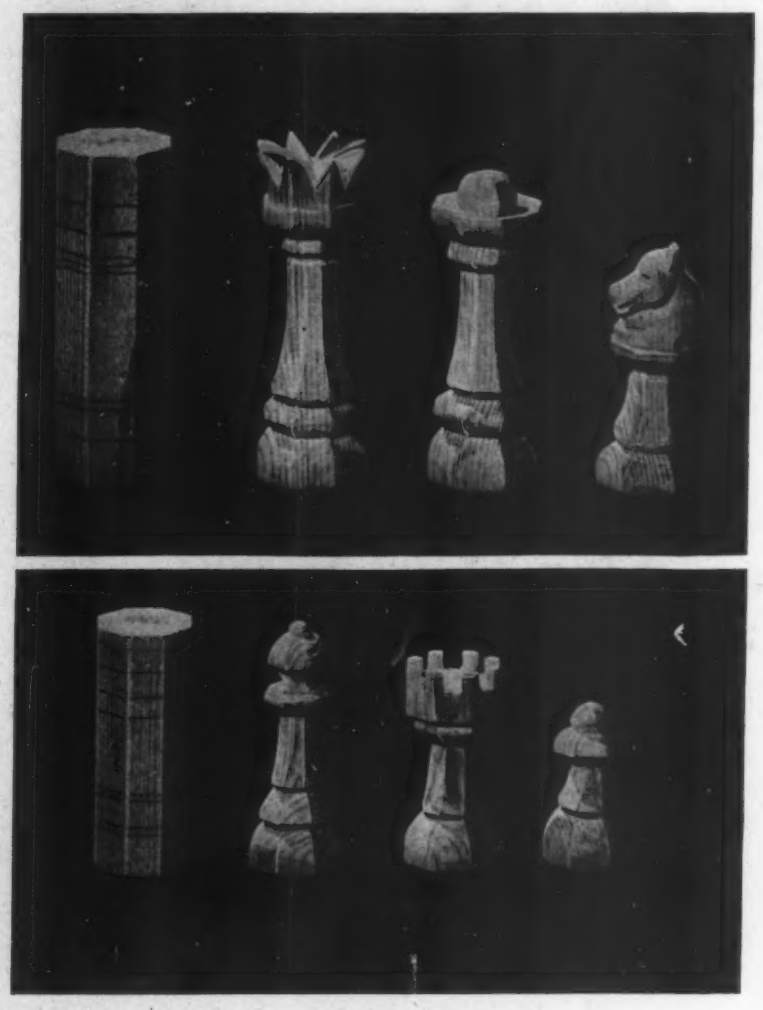


Fig. 111

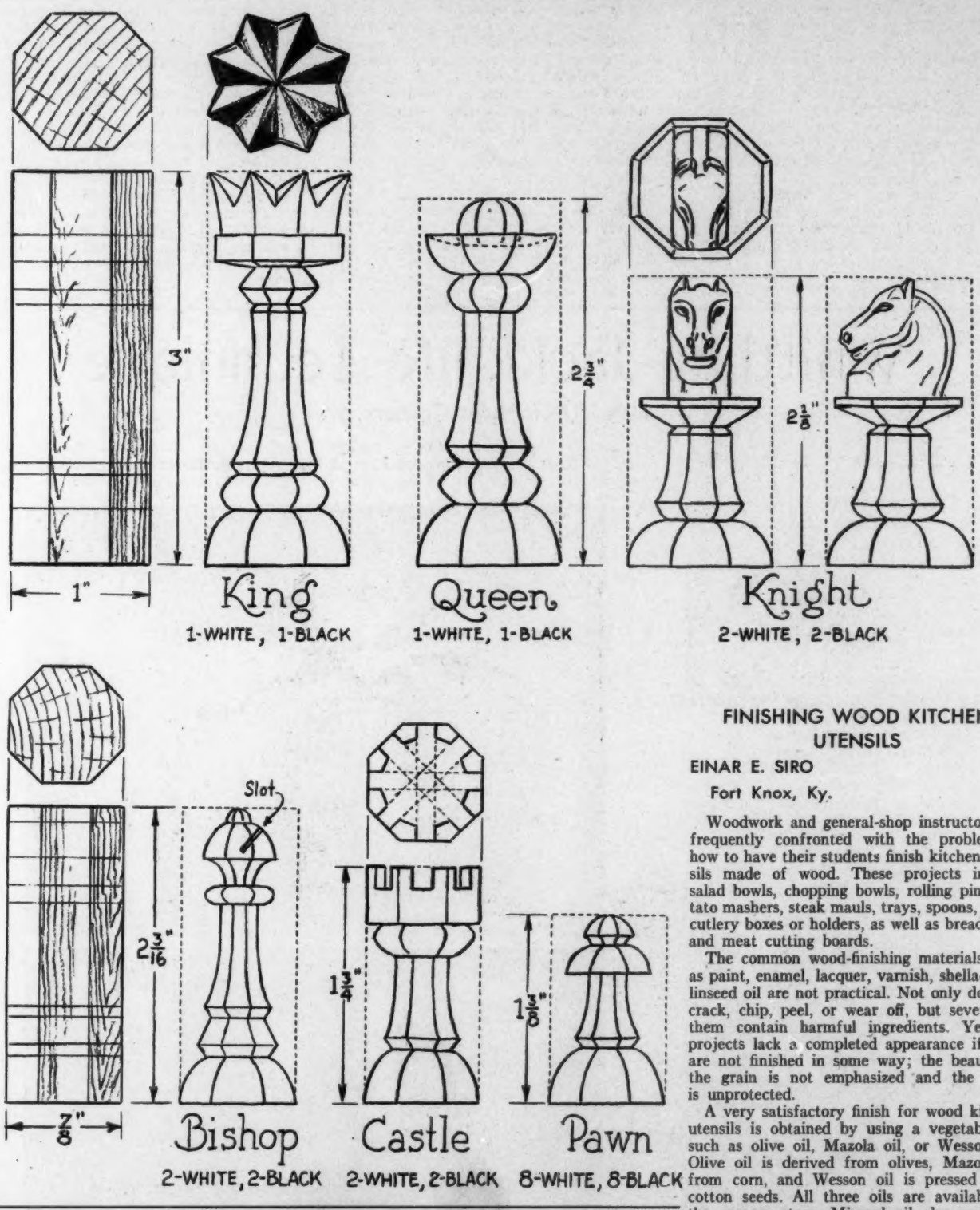


Fig. 110. Chessmen

taste. That is, the knife cuts may be left as they are, or the pieces may all be sanded before they are varnished. For sanding, the writer fastened a strip of fine sandpaper to a piece of galvanized iron, and used this in the same manner as one would use a thin knife file. This permitted sanding all the deeper cuts. The sandpaper may be fastened to the galvanized iron with silicate of soda (waterglass) or with shellac.

FINISHING WOOD KITCHEN UTENSILS

EINAR E. SIRO

Fort Knox, Ky.

Woodwork and general-shop instructors are frequently confronted with the problem of how to have their students finish kitchen utensils made of wood. These projects include salad bowls, chopping bowls, rolling pins, potato mashers, steak mauls, trays, spoons, forks, cutlery boxes or holders, as well as bread, fish, and meat cutting boards.

The common wood-finishing materials such as paint, enamel, lacquer, varnish, shellac, and linseed oil are not practical. Not only do they crack, chip, peel, or wear off, but several of them contain harmful ingredients. Yet the projects lack a completed appearance if they are not finished in some way; the beauty of the grain is not emphasized and the wood is unprotected.

A very satisfactory finish for wood kitchen utensils is obtained by using a vegetable oil such as olive oil, Mazola oil, or Wesson oil. Olive oil is derived from olives, Mazola oil from corn, and Wesson oil is pressed from cotton seeds. All three oils are available at the grocery store. Mineral oil also makes a good finish. There are several advantages in using these oils:

1. They are all edible oils — no poisonous or unsanitary ingredients are used in them.
2. They increase the durability of the article

(Continued on page 84)

WHAT ARE THE PURPOSES OF ORNAMENT?

Vents in the base are arranged in an orderly and pleasing pattern.

Hurricane Lamp

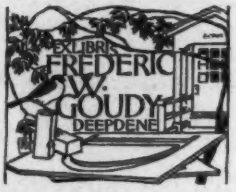
1. To establish order and balance in a structural part

Trivet

Cooking utensils rest on the balanced forged bars in the top.

In these examples the decoration consists of the orderly arrangement of purely structural parts into an interesting pattern.

2. To indicate ownership, or the beliefs, interests, religious, fraternal, or political affiliations of an individual. These may be turned to unsocial uses through ostentatious display to indicate wealth or superiority of position.



Bookplate by Vojtech Preissig

Chimney Pot and Weathervane for a Hunting Lodge by W. Hunt Diederich

Honor Society Key

Monogram of E. G. Gress

Ornament should *not* be used

1. When it obstructs use
2. When it weakens structure
3. When it causes a style anachronism
4. When it is meaningless
5. When it calls for treatment incompatible with the material on which it is used

Plate 12. Continuation of design course by Burl N. Osburn, Director of Industrial Arts, State Teachers College, Millersville, Pa.

WHAT CAN THE DESIGNER BELIEVE?

These lessons are based on the following creed:

1. Designing is reflective thinking working in visual form.

2. The designing technique (the process of being creative) is identical with the scientific method, and must be developed by study and practice to be effective.

3. Being creative is not an act of spontaneous generation by a mind untrained and uninformed.

4. Emotion, which may or may not accompany creative activity, is the result of the feeling of satisfaction (or lack thereof) in the rightness of the effort.

5. Dexterity, power of visualization, and general intelligence, are the forces that make for competency in designing in the visual arts, as well as constituting skill in producing them.

6. Painting, drawing, weaving, forging – in fact, all visual arts – are produced by the same common elements. Differences in the success of those who practice them are measures of quantity of effort and quality of thinking, rather than differences of kind.

7. Rightness – beauty – is and always has been relative to the times and circumstances. To hold that there are permanent standards of beauty, such as the "golden rectangle", irrespective of when or how used, is, in the language of Croce, to cling to the "astrology of aesthetics."

8. A democratic viewpoint can hold no hierarchy of rank among those who create, except that of the relative social worth of their contributions.

"The effort to make a useful object pleasing to the eye or touch gives the craftsman an understanding of the age-long struggle to bestow on objects of daily use that quality that renders their ownership one of life's events." — *Allen Eaton, Handicrafts of the Southern Highlands*

Plate 13. Design course by Burl N. Osburn, Director of Industrial Arts, State Teachers College, Millersville, Pa.

Allen Eaton's "Handicrafts of the Southern Highlands" published by the Russell Sage Foundation, New York City, 1937.

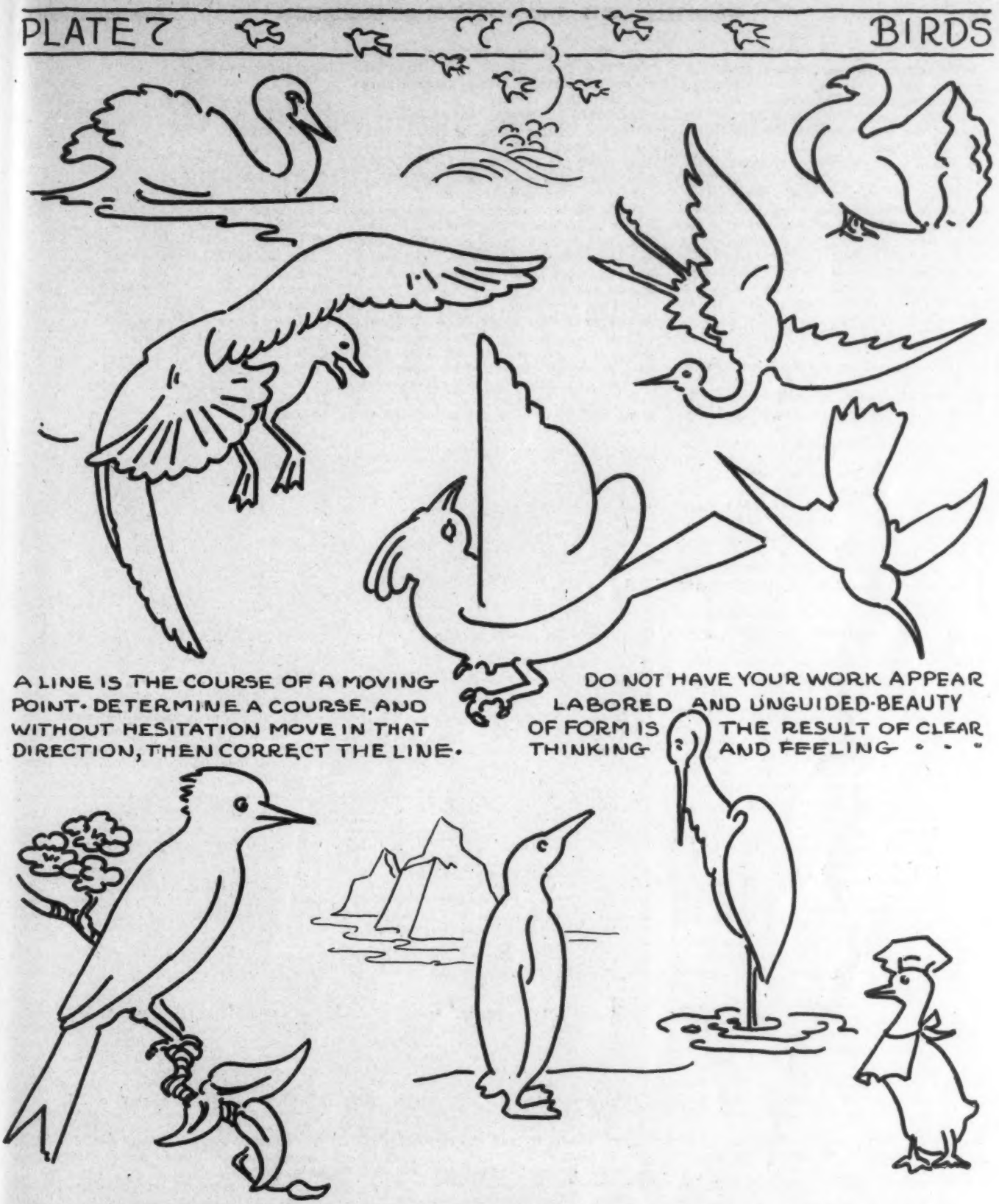


PLATE 7
BIRDS
A LINE IS THE COURSE OF A MOVING POINT. DETERMINE A COURSE, AND WITHOUT HESITATION MOVE IN THAT DIRECTION, THEN CORRECT THE LINE.
DO NOT HAVE YOUR WORK APPEAR LABORED AND UNGUIDED. BEAUTY OF FORM IS THE RESULT OF CLEAR THINKING AND FEELING . . .

Plate 7. Continuation of creative design course by Richard E. Bailey, chairman, art department, Central High School, Providence, R. I.

(Continued from page 80)

— oil penetrates the wood deeply, preventing moisture from entering, thus minimizing cracking, checking, and warping.

3. They improve the appearance of the article — the oil brings out the grain to a rich natural luster.

4. There is no chipping or cracking of the finish.

5. They are easy to apply. No brush is needed. A piece of clean cloth is sufficient. There is no streaking or overlapping of the finish. They can be applied or retouched in the home if necessary. Oil can be used directly out of the container in which it is purchased.

6. They are economical finishes — oil is reasonably priced, and a little oil goes a long way.

7. They make it easier to keep the articles clean — oil prevents juices and stains from entering the grain of the wood or adhering to the surface.

8. Wooden kitchen utensils in use in the home at the present time can be given this protective finish.

To apply an oil finish, sand the surfaces of the project as smoothly as for any other kind of finish. Apply the oil, either cold or warm, with a cloth.

It is advisable to heat the oil before applying, as heating causes the oil to become thinner, thus increasing its penetration. A satisfactory method of heating the oil is to place the container in hot water. If the container is glass, pour the oil into a metal container to avoid breaking.

Soak a small piece of cloth in the oil and apply to the surfaces of the project. Allow the project to dry, preferably overnight, and remove any excess oil or *bleeding* with a clean, absorbent cloth. Then polish the surfaces by rubbing with a cloth. The application of several coats of oil will improve the quality of the finish. One way to insure proper penetration of oil when finishing wood bowls, if sufficient oil is available, is to fill the bowl with oil and let it stand until the oil works through the pores to the outer surface. In case the oil causes the grain to raise a little, sand lightly with fine sandpaper.

Oil finish can be applied to turned projects after they have been sanded and before they are removed from the lathe. Apply oil with a cloth either while the work is revolving or held stationary. If a high finish is desired, polish the oiled project with a dry cloth while it revolves in the lathe.

When a large number of projects are to be finished, an oil bath can be used to advantage. Secure a container large enough to allow the projects to be completely immersed. Heat the oil to the boiling point, being careful that it does not boil or bubble. Immerse the projects and leave them in the oil until the desired penetration is obtained.

When the hot oil bath method is used, it should be remembered that hot oil can produce a serious burn. In case of an accident, apply tannic acid or a solution of baking soda.

OILING A PLATEN PRESS

EDWARD J. KRIZ

Senior High School

Dubuque, Iowa

The accompanying oiling chart was organized to simplify the instructional procedure of teaching beginners how to oil a platen press. The names of all parts have been checked for accuracy with a standard platen press parts list.

The chart will answer such questions as "Where Do I Begin Oiling the Press?" "How Much Oil Shall I Put in Each Hole?" "How Many Holes Are There to Be Oiled?" "What Is the Name of the Part Being Oiled?"

How the chart is to be used:

1. The teacher should give a group demonstration on how the platen press is to be oiled. Each student should be given a chart before the demonstration begins. As one student reads the chart aloud the teacher points to the part and oils it.

2. When a beginning student oils a press he will be checked by an advanced printing student. The advanced student will read the procedure to the beginner and check to see that the press is being oiled correctly.

After the beginner has followed the procedure four or five times, as outlined on the oiling chart, he will be well acquainted with not only the oiling procedure, but also the names of the parts of a platen press.

Procedure to Follow in Oiling a Platen Press

General Instructions

Begin and end at the same place.

Wipe off each oil hole after oiling, as well as any oil that may have dripped on the frame of the press or on the floor.

Begin at the front of the press looking over the lower feed table. Press is closed — rollers are up on the ink disk.

Name of part to be oiled	*No. of holes*	*Drops of oil per hole*
1. Roller saddles	6	1
2. Platen rocker shaft	2	3
3. Main shaft...	2	3
4. Gripper cam..	1	1

Press in normal position (open) — looking under lower feed table.

Name of part to be oiled	*No. of holes*	*Drops of oil per hole*
5. Lock roller...	1	1
6. Throw-off lever connections ...	3 joints	1
7. Left side rocker lock shaft	1	1
8. Bed shaft....	1	2
Left side looking over fly wheel		
9. Roller arm...	2 (one each end)	1
10. Left side arm.	2 (one each end)	1
11. Crankshaft ..	1	3
12. Lower throw off shaft...	1	1
13. Ink Disk shaft	1	1
Back of press from top to bottom		
13. Ink disk shaft	1	1
14. Back shaft...	2	2
15. Back connection to throw off...	2 (one each end)	1
16. Upper throw off shaft...	2 (one each end)	1
Gear side (right side) of press top to bottom		
17. Disk lever ...	1	1
18. Disk lever roller	1	1
19. Side arm (right)	2 (one each end)	1
20. Lower throw off shaft...	1	1
21. Crankshaft ..	1	3
22. Bed shaft....	1	2
23. Large gear cam wheel.	1	3

Cam wheel can be located through the hole in the side of the large gear wheel by turning the press over by hand to a point where the rollers are about halfway up the tracks on the bed of the press.

Personal News

► RAY F. KUNS, director of National Defense Training at the Aviation Vocational High School, Cincinnati, Ohio, received a $100 award in the Industrial Progress Award Program sponsored by The James F. Lincoln Arc Welding Foundation, Cleveland, Ohio.

► R. RANDOLPH KARCH, principal of The Printing High School, Cincinnati, Ohio, has received leave of absence to take up his duties with the U. S. Navy. He will first spend about one month at the Navy Pier, Chicago, Ill., and then assume his new position as instructional co-ordinator at the Naval Training School at Memphis, Tenn.

► Stout Institute men, now stationed at the Naval Training School, Navy Pier, Chicago, Ill., in the aviation-metalsmith school are: Clarence Krause, Chester Hylland, Lawrence Braaten, and Arnold Lien.

In the sheet-metal department are: William Byer, who is the director of sheet metal and welding; Harlen Woodward, the supervisor of sheet metal, Norbert Mettelka, Robert Maidl, Darby Worman, Richard Trezona, James Peterman, and Francis Walski.

In the welding department are: Kent Martin, Walter LaTondresse, the supervisor of welding, Douglass Drake, Duane Harold, Harold Kees, Lloyd Vande Berg, Eugene Halverson, Ralph Betterly, R. Bavaeie, Walter Hayes, A. R. Rowe, and James Govin.

In the aviation-machinists mates school are: Rex Battenburg and Eugene Neubaur.

► GERALD HAWKINSON and LAWRENCE CLARK, both of Menomonie, Wis., have begun their naval-reserve-officer training at Northwestern University.

► KEITH MOON, Hillsboro, Wis., has begun his naval-reserve-officer training at Notre Dame University.

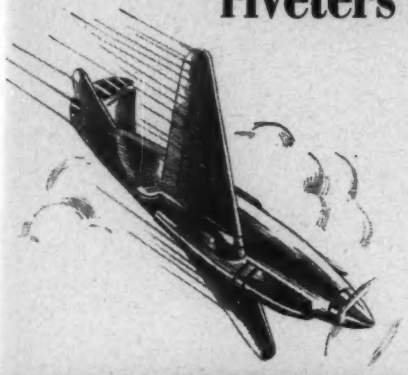
► Some of the men who have left The Stout Institute within the past few weeks are: CHARLES GARDNER, Florence, S. C.; ROBERT BEANDETTE, Menomonie, Wis.; ROBERT MEGOW, Jenkentown, Pa.; SAM BELECASTRO, Ellenworth, Minn.; WARD COWLES, Council Bluffs, Iowa; TOM KING, Springfield, Mass.; JOHN MERRY, Elkhorn, Wis.; and ROBERT WIELAND, Richland Center, Wis.

► WINFIELD W. SCOTT, supervisor of industrial arts, Topeka, Kans., received a $100 award in the Industrial Progress Award Program sponsored by the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio.

► FRED N. STARK, 50, superintendent of schools at Sherrard for the past eighteen years, and chairman of the Mercer County, Ill., draft board, died of a heart attack Tuesday morning, Dec. 1. Mr. Stark was largely responsible for developing the outstanding farm shop and manual training departments in the school.

"Exceptional tools for training aircraft riveters and sheet metal workers . . ."

—Says National Defense School Instructor



MR. GENE CUSHMAN, sheet metal instructor at the National Defense School, Des Moines, Iowa, says, "We use 20 or more Black & Decker ¼" Electric Drills in our program for training riveters and sheet metal workers for the aircraft industry. We've found them highly satisfactory—exceptional tools for our work."

Instructor Cushman expresses a view typical of vocational shops and schools all over the country. They find that training America's production rookies with industry's *first choice* tools pays off for these students upon "graduation" to war production lines. Students have a much better chance to *earn* with the tools on which they *learn* . . . because over half of America's war plants use Black & Decker Portable Electric Tools in their production setups. They have the "feel" of them from the very beginning of their careers.

Phone your nearby Black & Decker Distributor for a demonstration of the tools you need in your training program. He'll be glad to work with you.

STUDENT at National Defense School uses Black & Decker Drill on the leading edge section of metal aircraft wing. When he "graduates" to the aircraft industry, he'll more than likely be using Black & Decker Tools there, too.

Lessons in Ingenuity

FREE

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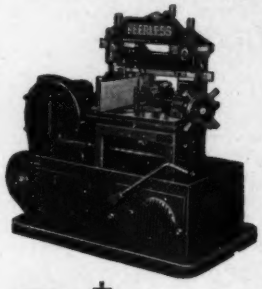
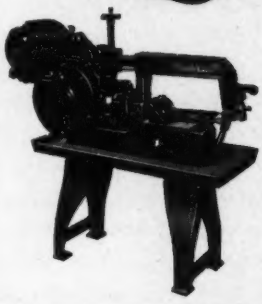
Peerless Power Saws are preferred by industry for fast, accurate metal cutting — and by instructors, too, who know the importance of actual experience with modern tools in vocational training.

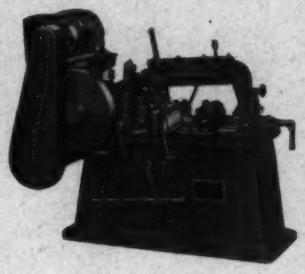


Peerless Saws meet the requirements of wartime's production pace — they combine safety features, accurate cutting, and operating economy with speed.



Such features as Peerless hydraulic control, including length gauging on the automatic types and the patented Four-Sided Saw-Frame and Backing-Plate Blade-Support have set a new standard for power sawing.

There are four bulletins covering the broad Peerless Line — Bulletin 50-A on High Duty Hydraulic types . . . Bulletin 53 on Heavy Duty, Hydraulic, Vertical cutting saws for die-block work . . . Bulletin 51-A for Universal types with mechanical control . . . and Bulletin 52 cover Standard Models for general utility cutting.



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CAP. @ 45° ANGLE	4"x6"	6"x10"		6"x10"	9"x13"	4"x6"	5¾"	
SPEEDS (3) STROKES PER MIN.	60-100 140	50-85 125	50-85 125	50-85 125	50-85 125	50-85 125	50-85 125	75-100
FLOOR SPACE	30"x54"	36"x57"	24"x43"	30"x68"	38"x75"	21"x54"	26"x86"	16"x30"
SHIPPING WEIGHT WITH MOTOR	2170 LB.	2930 LB.	1000 LB.	2175 LB.	3200 LB.	1125 LB.	1460 LB.	250 LB.

Association News

A.V.A. CONVENTION

With members present from every state in the Union, and with representatives of the U. S. Army, the Navy, the War Manpower Commission, war industries, and federal and state officials participating, the War Work Training Conference of the American Vocational Association was held in Toledo, Ohio, December 2 to 5.

The convention-conference made a noteworthy contribution to the all-out war man-power training effort in every field of vocational education. So intent were members of the conference in their deliberations that a number of the sectional meetings extended far beyond time limitations, one afternoon session running until 7 o'clock in the evening. Approximately 1200 A.V.A. members were registered, and total attendance was estimated at 1500 by L. H. Dennis, A.V.A. exeeutive secretary.

Streamlined to meet the fast moving pace of war production, all general and sectional meetings not only assumed a wartime march tempo but provided inspiration and ideas for greater efficiency and effectiveness in war job training to the point where substantial advancements may be expected in the year ahead.

Teacher shortages, teacher-training needs, and postwar curriculum requirements occupied the major attention of the industrial-arts education section. The trade and industrial section devoted most time to various phases of the national program of vocational training for war-production workers.

These deliberations were climaxed in a resolution adopted by the House of Delegates which requested that "the U. S. Office of Education be urged to use every means at its command to assist the vocational schools of the nation in operating to the fullest extent possible for 12 months of the year."

This action, doubtless growing from the year-round, 7-day week, 24-hour day program for the training of war-production workers, was unanimous and places the A.V.A. on record as the first major educational organization to advocate an accelerated program at the secondary school level. In effect, such an accelerated program, if adopted, would enable vocational high school boys and girls to complete their secondary school training before reaching the draft minimum age of 18 years. This would give such youth opportunity to enter earlier on war-production jobs or enable boys eligible for selective service to enter the armed forces far better prepared for assignment to specific duties. The resolution also asked the Office of Education to review all existing policies for the war-production worker training program "for the purpose of inaugurating such changes as may be required . . . for the duration of the war and the postwar period to come."

It was especially indicated through resolutions that the industrial-arts program has a valuable contribution to make in the war effort and in postwar problems and their solution. A resolution declared that the A.V.A. "urge that representatives of this field of education (industrial arts) be included in all groups studying the problems pertaining to educational adjustments."

The conference keynotes were cited by speakers on the opening Wednesday evening program, and discussions in more than sixty sectional meetings that took place during the next two and a half days were geared to the calls for still more vocational education service to the Armed Forces and to war industries.

Brigadier General Frank J. McSherry, then director of operations, War Manpower Commission and who now has been returned to active Army service, said almost 5,300,000 had been trained in public vocational schools since June, 1940. He said there was a bigger job ahead for the coming year when 6,300,000 additional workers will be needed in war industries. "If all Manpower Commission problems could be handled as you have handled vocational training, we would have no problems," he said in complimenting the vocational schoolmen on their "doing a grand job."

Through preinduction training for the Armed Forces the vocational schools have a new and effective responsibility, Merwin M. Peake, chief, Pre-Induction Training Section, U. S. War Department, told members of the conference. Last January the Army requirements were for 63 trained specialists out of each 100 men, but the need has now increased to 68 per 100, he said. Of the remainder, 18 require special training in military schools, leaving only 14 of each 100 men unassigned. Less than 50 per cent of the men entering the Army have any technical skill or knowledge that can be used as foundation training for Army jobs, Mr. Peake added. More than 50,000 copies of outlines giving Army needs through preinduction training have been sent to school superintendents and principals.

A vivid description of the reasons why thorough training of men to handle mechanized units is needed in modern warfare was given by Brigadier General Stephen G. Henry, commandant, the Armed Force School, Fort Knox, Ky. He described the teaching procedure at Fort Knox and the great variety of engines, guns, radio, and other equipment, a knowledge of which must be mastered by those who man the tanks and other mechanized units. "A soldier who knows his way around the field of battle stands the best chance of doing his job and coming out alive," he said, adding, "A trained man is not cannon fodder."

The war service angle of the industrial-education section meetings is seen in some of the

(Continued on page 20A)

INDUSTRY CRIES....
"GIVE US TRAINED PEOPLE FASTER!"

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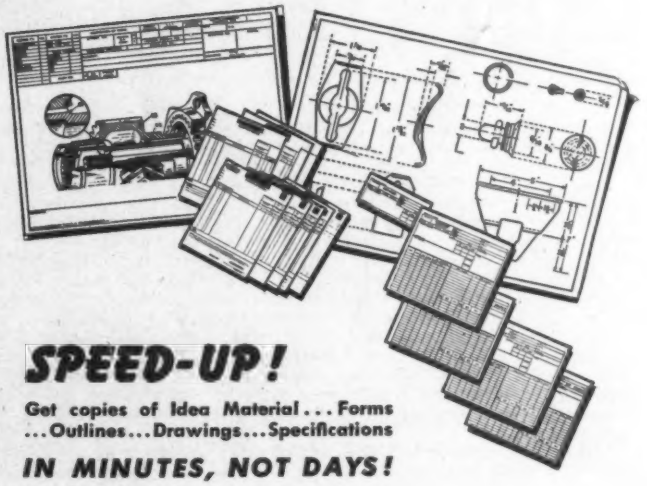

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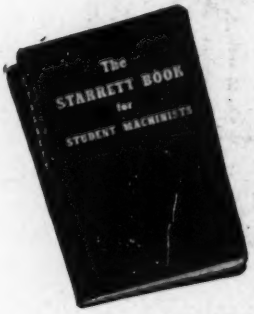

It's chock full of illustrations, diagrams and information about fine precision tools—their construction and how to use them—that will prove extremely helpful to you in your vital work of teaching your boys the value and importance of fine tools. More than that, the *Starrett Book* contains more than 30 handy reference charts, plus a wealth of essential information about machines and modern metal working practices that make it an up-to-the-minute instruction manual for students and trainees.

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(Continued from page 18A)

discussion topics: training for the aviation industry; labor and industrial relations; training within industry; training women for industry; training courses for civilian personnel for the military forces; developments in radio and communications; diversified cooperative training; instructional aids and publications; training for safety; the long-term industrial education program; the apprentice program; industrial education for the postwar period; manning machines on the war-production front; welders for war-production jobs; vocational education in civilian defense; and vocational visual aids in war-production worker training. A Saturday morning program on industrial mental health proved to be exceptionally interesting and productive of helpful information.

Sectional meetings in industrial-arts education were in keeping with wartime trends. Speeding up of training, conversion of teachers from other fields, recruiting competent young women with native manipulative skills, and the recalling of retired teachers for the emergency were some of the problems discussed. The need for revision of the curriculum to meet postwar conditions was emphasized. Reconstruction will make a heavier demand than ever before upon the industrial arts. One of the trends noted was the increasing number of girls in school shops. Suggestions for the curriculum for small high schools were received.

In view of the war emergency the A.V.A. Executive Committee canceled the annual A.V.A. banquet and in its place conducted a "Vocational Information, Please" program on Thursday evening. In view of the cost of the banquet members were urged to purchase War Stamps in a special booth in the lobby of the headquarters hotel. The booth was built by students of the Toledo Macomber Vocational High School and sales amounting to several hundred dollars were conducted by students from Macomber and Whitney Vocational high schools.

A. L. Threlkeld, national director, High School Victory Corps, addressed the general session which followed a reception for A.V.A. President John J. Seidel, members of the Executive Committee and representatives of the Toledo Convention Committee. The "Information" program proved to be both entertaining and instructive.

Another feature of the conference program was a general session at Macomber auditorium which included a youth symposium by students of Toledo's vocational and academic high schools in which they debated the merits of both forms of secondary education. This program was under the direction of E. L. Bowsher, superintendent of Toledo schools. It was followed by addresses on education's place in the war by Kenneth C. Ray, Ohio State Director of Education, and Grove Patterson, editor of the *Toledo Blade*.

Chicago was selected as the 1943 A.V.A. convention city.

Fred A. Smith, Little Rock, state director of vocational education in Arkansas, was elected president of the A.V.A. to succeed John J. Seidel,

Fred A. Smith, president, American Vocational Association; state director of vocational education, Little Rock, Arkansas

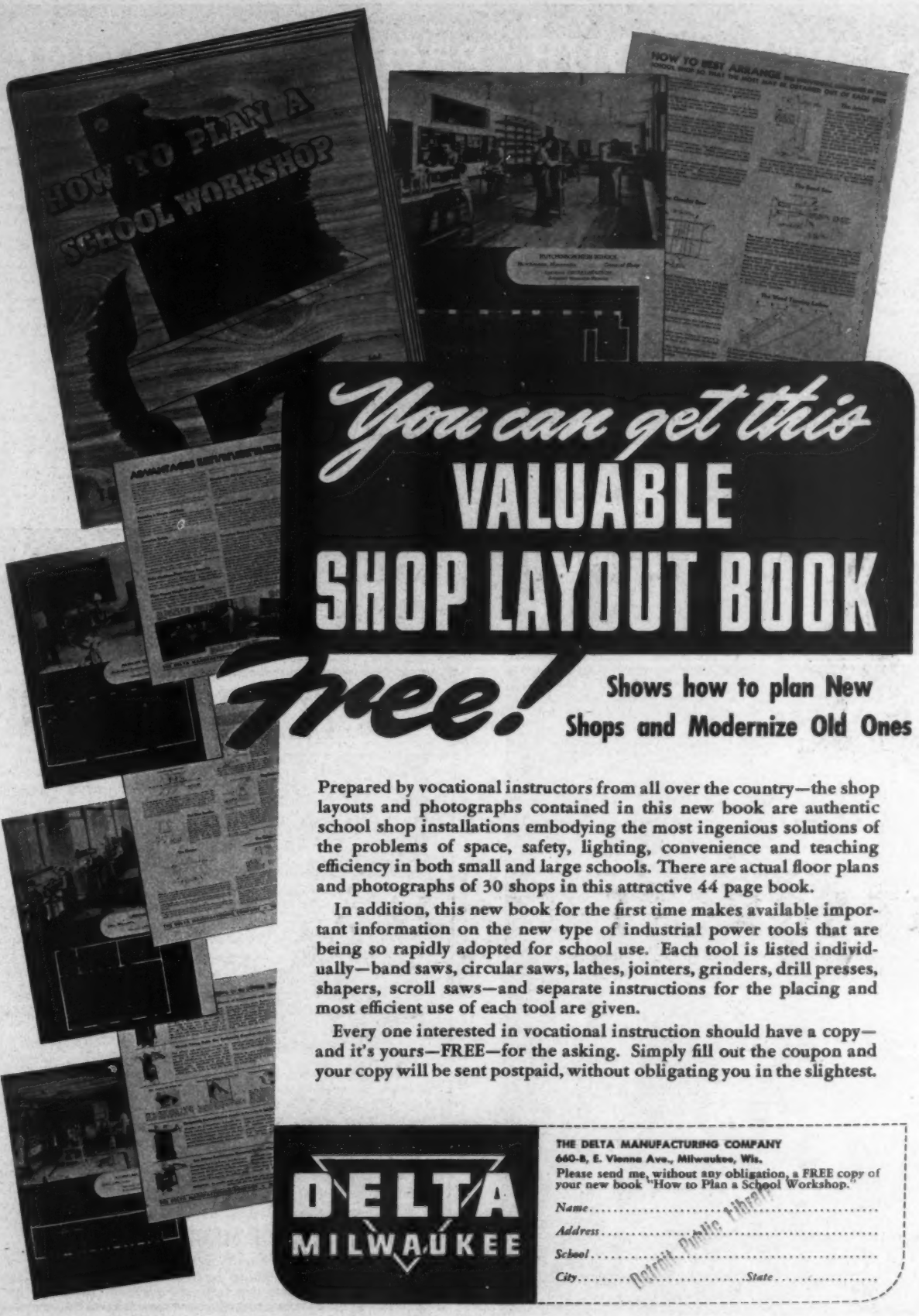
assistant state superintendent in charge of vocational education, Baltimore, Md. He had served four years as A.V.A. vice-president for agricultural education. W. F. Stewart, Department of Agricultural Education, Ohio State University, Columbus, Ohio, was elected vice-president for part-time schools, and J. A. Guitteau, Olympia, Washington, State Supervisor of Agricultural Education, was chosen vice-president for agricultural education.

Charles W. Sylvester, director of vocational education in the schools of Baltimore, Md., was re-elected A.V.A. treasurer for the fourteenth year. Mr. Sylvester was the recipient of the annual citation from "The Ship," A.V.A. convention exhibitors' organization, an award given each year to that member of the A.V.A. whom the organization believes has made an outstanding contribution to vocational education.

The Association of State Directors of Vocational Education elected John A. McCarthy, state director of vocational education, Trenton, N. J., as president; Ralph H. Woods, Frankfort, Ky., vice-president; and G. E. Freeman, Nashville, Tenn., as secretary.

Clyde H. Wilson, professor of industrial education, University of Tennessee, was elected president of the National Association of Industrial Teacher Trainers. Walter B. Jones, University of Pennsylvania, was chosen secretary.

(Continued on page 23A)



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In addition, this new book for the first time makes available important information on the new type of industrial power tools that are being so rapidly adopted for school use. Each tool is listed individually—band saws, circular saws, lathes, jointers, grinders, drill presses, shapers, scroll saws—and separate instructions for the placing and most efficient use of each tool are given.

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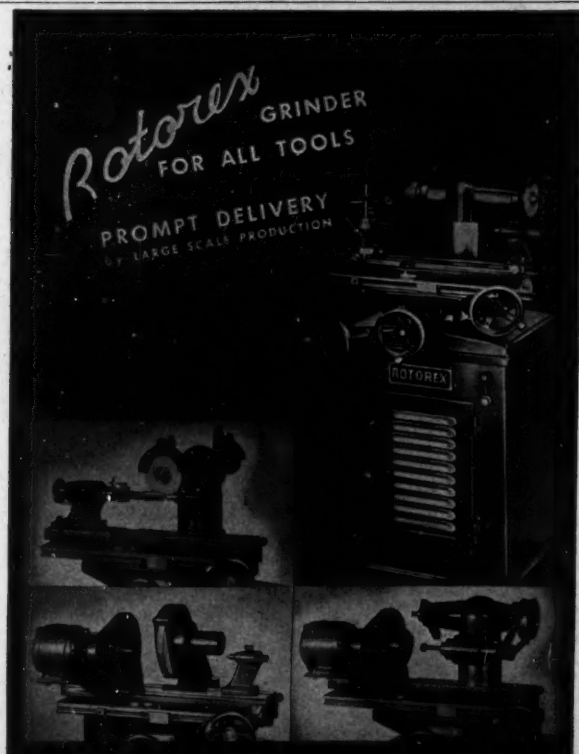

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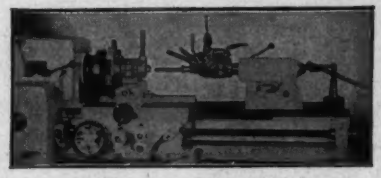
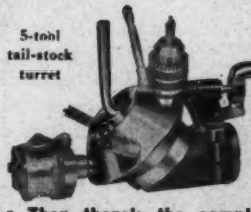


Train TURRET LATHE Operators on your ENGINE LATHE

Turrets applied to 16" lathe



5-tool tail-stock turret

• This new modern TOOL-POST TURRET (below, right), made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard tool holders which are easily inserted and rigidly held. *15 days delivery.*

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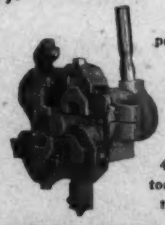

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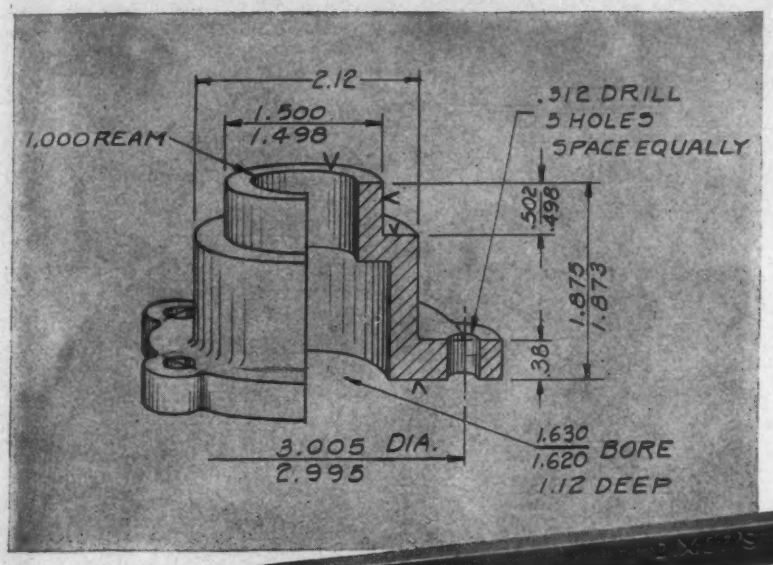

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SOLUTION: We'll send you a free blueprint showing the problem's solution if you write to address at right within 30 days, specify Blueprint No. 128J2.

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(Continued from page 20A)

Two national industrial education organizations were merged at Toledo. They were the National Association of Trade School Principals and the National Council of City Administrators of Vocational Education and Industrial Arts. The new organization is to be known as the National Council of City Directors of Vocational Education, Industrial Arts, and Trade School Principals. Charles F. Bauder, Philadelphia Director of Vocational Education, retiring president of the Trade School Principals Association, was named president of the new group. Earl L. Bedell, Detroit Director of Vocational Education, is secretary, and Edward Berman, assistant superintendent of schools, Bayonne, N. J., is treasurer.

D. M. Cresswell

(To be continued)

A.I.A.A. CONVENTION

"Industrial Arts in War and Postwar Times" will be the theme of the American Industrial Arts Association convention which will be held in connection with the annual meeting of the American Association of School Administrators at the Coronado Hotel, St. Louis, Mo., February 26 to March 1, 1943.

The following is a tentative program of the sessions to be held during this convention.

Friday, February 26, 1943, 10:00 a.m.—registration and caucus of officers and delegates. Louis V. Newkirk, Chicago, Ill., director of industrial arts, board of education, and president of the American Industrial Arts Association, will preside.

The subject of the afternoon meeting at 2:30 will be "The Wartime Use of Industrial Arts Laboratories." George H. Hargitt, director of industrial arts, board of education, St. Louis, Mo., will preside.

John A. Whitesel, Oxford, Ohio, professor of industrial-arts education, Miami University, and chairman of the Association's Council of States and Territories, will present the report of a national inquiry sponsored by this association for *The American School and University Yearbook of 1943*.

Saturday, February 27, 1943, 9:00 a.m.—the subject of "Industrial Arts in the Victory Corps Program" will be covered with Elmer W. Christy, director of industrial arts, board of education, Cincinnati, Ohio; and vice-president of the association, presiding. The speakers on this occasion will be A. L. Threlkeld, victory corps director, United States Office of Education, Washington, D. C.) and Verne L. Pickens, director of industrial arts, Kansas City, Mo.

At 12:15 p.m. the president's luncheon will take place. The toastmaster will be John J. Hatch, chairman, department of industrial arts, State Teachers College, Newark, N. J., and executive secretary and treasurer of the association. "The Program of the American Industrial Arts Association" will be presented by Louis V. Newkirk, Chicago, Ill.; and Allen D. Backus, director of industrial arts, board of education, Newark, N. J., and chairman of the association's affiliates and delegates, will discuss "The Work of Our Affiliates. Presentation of Certificates."

At 2:30 p.m. "Industrial Arts in the Air-Age Programs" will be discussed. Harold G. Palmer, professor of industrial arts, State Teachers College, Cedar Falls, Iowa, will preside. There will be presentations of plans and reports of progress by: Ted Ballak, State Bureau of Aeronautics, St. Paul; W. G. Briegleb, Briegleb Sailplane Company, Beverly Hills; Roy G. Fales, State Department of Education, Albany; Norman Larson, Bawlus Sailplane Company, San Fernando; John R. Ludington, State Department of Education, Raleigh; John T. Lynch, University of Denver; I. P. Mattahiessen, Junior Chamber of Commerce, Chicago; and Gordon O. Wilber, State Teachers College, Oswego.

Monday, March 1, 1943, 9:00 a.m.—"Industrial-Arts Teacher Education and Shortages in a Time of War" will be under discussion. Edward S. Maclin, president, West Virginia Institute of Technology, Montgomery, W. Va.; and vice-president of the association for teacher education, is chairman.

The following subjects will also be discussed: "The Nature and Province of Industrial-Arts Education," "The Practical Arts in a Modern Program of Teacher Education," "Industrial-Arts Teacher Shortages and Remedies," and "Summary and Implications of the Session."

The speakers will be George C. Decked, professor of industrial-arts education, State Teachers College, Buffalo, N. Y.; George D. Stoddard, president, University of the State of New York, Albany, N. Y., and commissioner of education; Harold J. Bowers, supervisor of certification, State Department of Education, Columbus, Ohio; and Roscoe Pulliam, president, Southern Illinois State Normal University, Carbondale, Ill., respectively.

At 12:15 p.m. a luncheon meeting will be held. Louis V. Newkirk will preside.

At the 2:30 p.m. meeting "Industrial-Arts Education in the Postwar World" will be discussed. Heber A. Sotzin, chairman, department of industrial-arts education, State College, San Jose, Calif., and chairman of the association's Curriculum Commission, will preside at this meeting. Walter Crosby Eells, executive secretary, American Association of Junior Colleges, Washington, D. C., will speak on "Industrial Arts and the Work Experience Movement in Education"; William L. Wrinkle, director of the Laboratory School, State College of Education, Greeley, Colo., will present "Industrial Arts in the Core Programs at All Levels;" Willard E. Givens, executive secretary, National Education Association of the United States, Washington, D. C., will present "Industrial Arts in the Proposals of Senate Bill 1313"; William E. Warner, professor of education, Ohio State University, Colum-

(Concluded on page 24A)

Filing Hints to meet war-time needs

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THESE FILES are for precision filing, such as required in die and tool work. They are made in seven cuts, Nos. 00, 0, 1, 2, 3, 4, 6. No. 00 files should be used where the removal of metal is to be rapid. However, No. 1 or No. 2 is recommended where the stock is light or of thin gauge. In smoothing or finishing, and for all filing on thin and hard materials, use No. 3, No. 4 or No. 6.

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Hand		Uniform in width. Tapered in thickness. Two flat sides are double cut. One edge is double cut; other edge is safe or uncut.	Flat surfaces
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Three Square		Tapered. Double cut on all three sides. Single cut on edges.	Corners, holes
Round		Either uniform or tapered. Double cut.	Corners, holes
Half Round		Tapered in width and thickness. Flat and half round sides are double cut.	Corners, holes
Knife		Tapered in width and thickness. Double cut on flat sides. Single cut on edges.	Slots
Crossing		Oval shape, with radius of one side greater than the other. Double cut.	Corners, holes
Equalling		Uniform in width and thickness. Double cut on flat sides and edges.	Slots
Barrette		Cut on wide flat side only. Back and beveled edges are safe or uncut.	Corners
Crochet		Flat in shape, with rounded edges. Double cut on flat sides and edges.	Slots

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(Concluded from page 23A)

bus, Ohio, and past president of the American Industrial Arts Association, will discuss "Prospects for Industrial-Arts Education in Global Perspective;" and Sherman D. Scruggs, president, Lincoln University, Jefferson City, Mo., will give a general discussion on the "Summary and Implications of the Session."

At 7:00 p.m. there will be a meeting with the art department of the N. E. A. at its annual banquet. Marion E. Miller, director of art education, board of education, Denver, Colo., is president.

► The Milwaukee Industrial-Arts Teachers' Association held its annual fall meeting on Wednesday, December 9, 1942, at a dinner meeting at 6:15 p.m.

After the dinner a business meeting was held. Ed. Rang, president of the association, conducted the election of officers.

The following were elected for the coming year: John W. Dunlop, president; Otto H. Braun, vice-president; Archie Muehl, secretary-treasurer; and Axel Davidson, committeeman at large.

Miles Henninger, patent attorney with Allis-Chalmers Company, then gave an illustrated lecture on "Basic Patents Which Have Affected American and World Industry."

► The U. S. Office of Civilian Defense, Washington, D. C., has just issued a "Fire Bomb Fact Sheet" describing the different types of incendiary and incendiary-explosive bombs used by our enemies, and giving methods of how best to extinguish the fires caused by them.

Answers to Questions

A QUESTION OF IDENTITY

In answer to question No. 1083, which appeared in the March, 1942, issue of this magazine under "The Question of Periods," it seems quite certain that the rocker shown in the illustration is not a Boston rocker. The questioner asks if it is a Vermont rocker. I do not know about

Boston rocker

that; I have been unable to find one cataloged under that name. However, the Boston rocker is quite well authenticated in several well-known collections, as for instance, in the Mabel Bradley Garven collection, housed in Yale University, and in the extensive collection of the Museum of the City of New York, as well as in the Metropolitan Museum of Art. The chair shown in the March issue of this magazine should also be compared with the Boston rockers as illustrated in *The Magazine of Antiques*, May, 1928.

The Boston rocker as recognized by collectors is the type illustrated herewith. In the early part of the past century these must have been very well distributed over the East and Middle West.

The rocker shown in the March, 1942, edition is perhaps one made and designed by some lone cabinetmaker, or some factory of limited output. It does not conform to any well-known design.

—*J. I. Sowers*

News Notes

► Applications for inspector positions in the Production Protective Service of the War Department continue to be accepted by the U. S. Civil Service Commission. The positions are extremely important to the war effort, as the inspectors will function for the protection of some 6500 major factories engaged in war work. The salaries for these inspector positions range from $2,600 to $5,600 a year, but applications are particularly

(Continued on page 26A)

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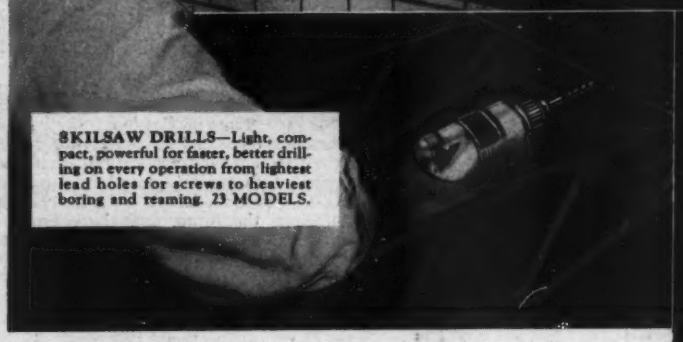

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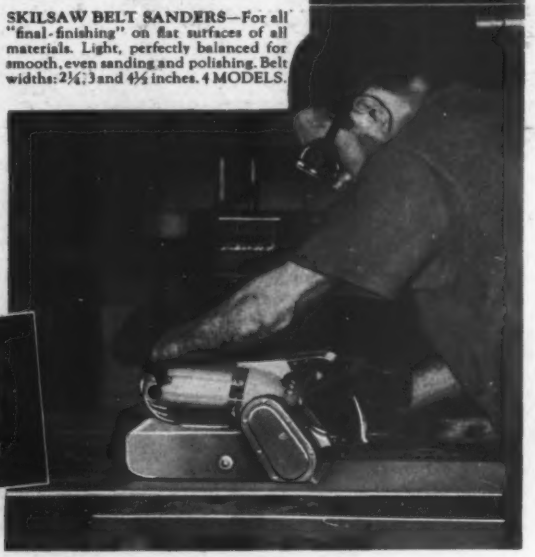

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(Continued from page 24A)

sought from persons who are qualified for and will accept the salaries of the grades from junior inspector at $2,600 to senior inspector at $3,800 a year.

Inspectors will be responsible for making recommendations to prevent interruptions or delays in the production and delivery of all types of war material caused by major accidents, explosion, or other hazards inherent in manufacturing plants. No written test will be given. Applicants will be rated on their education, experience, and personal qualifications, as soon as possible after the applications are received at the U. S. Civil Service Commission, Washington, D. C.

Applications will be accepted until further notice, but qualified persons are urged to apply immediately unless they are already using their highest skills in war work. Announcements and applications may be obtained at any first- or second-class post office or from the U. S. Civil Service Commission in Washington, D. C. War man-power restrictions on federal appointments may also be consulted at these offices.

► Lithographers are urgently needed in federal agencies for reproducing maps vital to the war effort. The United States Civil Service Commission is seeking artistic and mechanical lithographers for immediate appointments. Most critical is the need for lithographers experienced in platemaking, transfer work, and presswork. Positions exist in Washington, D. C., and in other parts of the United States. Applications must be filed with the Civil Service Commission, Washington, D. C.

Persons are desired for positions offering entrance salaries of from $1,440 to $2,000 a year. They must have had at least 9 months of appropriate skilled lithographic experience in a lithographic shop, or adequate resident study in one or more branches of lithography completed at a lithographic school, college, or technical institute. For positions paying $1,440 a year, no other experience is required. A completed U. S. War Training Course in lithography will qualify applicants for the $1,440 positions.

Persons are particularly desired who have had lithographic experience on maps. There is no maximum age limit. Persons must be 18 years or over. Applicants must be physically capable of performing the duties of the position. No written test is required.

Announcement No. 205 for lithographer and application forms may be obtained at first- and second-class post offices (except in the Commission's regional headquarters' cities, where they must be obtained from the regional office) or from the Commission's Washington office.

► Repairmen for office appliances are being sought for federal agencies in Washington, it is announced by the U. S. Civil Service Commission. The positions pay $1,860 a year.

No written test will be given but applicants must show that they have had within the past 10 years at least one year of full-time paid experience in the maintenance, repair, and complete overhaul and adjustment of office appliances or machines, such as typewriters, calculating machines, dictation recording machines, teletype machines, folding machines, addressograph, or graphotype machines and related types of office appliance and laborsaving devices.

Experience as a salesman or adjuster making only incidental and operating adjustments is not qualifying.

Applications should be filed with the Commission's Washington office. No closing date is set for accepting applications. Copies of the announcement giving further information regarding the positions, and application forms, may be obtained at first- and second-class post offices except in the Commission's regional headquarters' cities where the forms must be obtained from the regional director.

► Twenty centers in Kansas have been tentatively selected in which fire department instructor training conferences will be held. These conferences will be sponsored jointly by the Kansas State Board of Vocational Education, the Kansas State Firemen's Association, and the Kansas State Council of Defense. Governor Payne Ratner is chairman of the latter group.

The conferences are for the purpose of making available to each fire department of the state a fireman trained in instructional methods. These instructors will be used in the training of local firemen and auxiliary firemen who will serve in cases of emergency due to sabotage or bombing.

Captain Harley Yocum, Atchison, and Captain Fred Dimond, Hutchinson, have been selected to conduct these conferences. They are now attending a two-week instructor training conference at Stillwater, Okla.

♦ The Occupational Index, established in 1936 under a grant from the Carnegie Corporation, has just announced that in the future it will review, annotate, index, and evaluate all new publications on military occupations; including all books and pamphlets which describe the attractions and the disadvantages, the opportunities and requirements of all branches of the Army, Navy, Marines, Coast Guard, Air Corps, Waacs, and Wows, and the Service Projects for Conscientious Objectors. New subscribers will receive a recommended list of publications already available. The Occupational Index is published quarterly at New York University; the annual subscription price is five dollars.

♦ The Board of Education, Edwardsville School District No. 77, Edwardsville, Ill., announced through its superintendent, E. L. Alexander, the establishment of a general shop in the Senior High school for the year 1942–43. The shop will be housed in the new addition to the school building.

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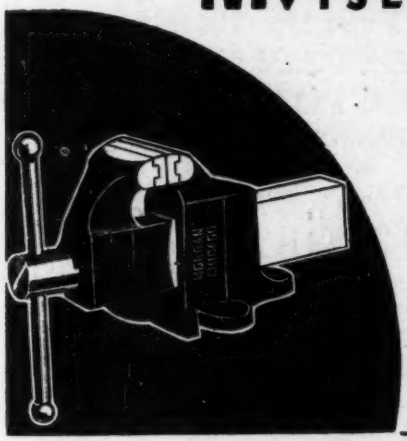

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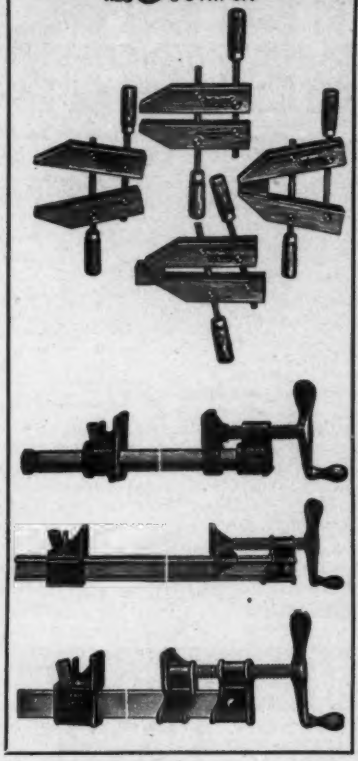

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New Publications

Looking Ahead to High School With the Three Deuces

By Clifford E. Erickson and Lillian Von Brenner. Cloth, 157 pages, 5¼ by 8 in., illustrated. Price, $1.50. Published by McKnight & McKnight, Bloomington, Ill.

An interesting story of three pupils who are just starting their high school career. It portrays vividly the new life which they enter and how they react to it at school, in their social contacts, and in their home life.

New Commercial Technical Dictionary

By Antonio Perol Guerrero. Cloth, 600 pages, 6¼ by 9¼ in. Price, $10. Published by The Chemical Publishing Co., Inc., Brooklyn, N. Y.

An up-to-the-minute Spanish-English and English-Spanish dictionary compiled for the engineer, technician, and businessman. This book is especially useful now that the relationships between our country, Mexico, Central America, and the South American countries are becoming much closer.

Definitions of modern terms referring to mechanics, engineering, aircraft, aviation, shipbuilding, marine and naval terms, industrial chemistry, plastics, and meteorology may all be found in this book.

How to Read Electrical Blueprints

By Gilbert M. Heine and Carl H. Dunlap. Cloth, 318 pages, 5¾ by 8⅜ in., illustrated. Price, $3. Published by American Technical Society, Chicago, Ill.

The purpose of this book is to acquaint its readers with the symbols used in the various divisions of the electrical industry, and to show how these symbols are used on plans and drawings.

The material is divided into architectural work, bell and signal wiring, house and building wiring, automobile wiring, generators and motors, control diagrams and power-station wiring.

The book is comprehensive, with copious illustrations.

Oxy-Acetylene Welding and Cutting

By J. W. Giachino. Cloth, 196 pages, 6⅛ by 9¼ in., illustrated. Price, $1.96. Published by The Manual Arts Press, Peoria, Ill.

This book is divided into 26 units which give the student a thorough insight into the art and science of gas welding.

Resource Units for Teachers in Pre-Flight Aeronautics

Prepared by the workshop in preflight aeronautics at the University of Minnesota, summer of 1942. Paper, 81 pages. Price, $1.25. Published by Burgess Publishing Co., 426 S. 6th St., Minneapolis, Minn.

Last summer a group of high school teachers from various parts of the United States gathered at the University of Minnesota to plan the teaching of preflight aeronautics in the high school. This booklet is the result of their planning and research. It oulines five units covering the correlation of aeronautics with social studies, aerodynamics, engines, navigation, and meteorology. An appendix presents three demonstrations in aerodynamics, a demonstration model airplane, and multiple-choice tests. The many bibliographies of books, pamphlets, magazine articles, and visual material will be welcomed by teachers.

Practical Mathematics for Home Study

By Claude Irwin Palmer and Samuel Fletcher Bibb. Cloth, 697 pages, illustrated. Price, $4. Published by the McGraw-Hill Book Co., New York City.

This is the third edition of a book on mathematics which deservedly enjoys great popularity.

It starts out with common arithmetic and then advances through algebra, geometry, and trigonometry. There are numerous applied and drill problems.

Fire Prevention Education

By Dr. Charles C. Hawkins, National Board of Fire Underwriters, Center for Safety Education, New York University, 8 Fifth Ave., New York City. The book contains 364 pages. Single copies, 85 cents. Orders and inquiries regarding quantity prices should be addressed to National Board of Fire Underwriters, 85 John St., New York City.

This book is the result of a cooperative effort between the National Board of Fire Underwriters and the New York University Center for Safety Education.

It is primarily intended for teachers and school administrators, fire chiefs, public officials, civilian defense workers, and youth leaders. Part I includes the organization and administration of the school program, fire prevention and protection, and fire-safety material and activities for students on the elementary and secondary school levels.

Part II shows how this same material may be applied to a community program.

Teacher Training for Industry

By C. C. Aiken and Scott B. Lilly. Cloth, 144 pages, 5⅜ by 7⅝ in. Price, $1.25. Published by McGraw-Hill Book Co., New York City.

A book developed by a group of industrial training and personnel executives and engineering teachers under the chairmanship of the authors. Its purpose was to overcome the shortage of trained teachers by producing a text which could be used for giving a concentrated 10-session, 20 or 25-hour course for the purpose of preparing qualified men as teachers.

Tool Design

By Charles B. Cole. Cloth, 498 pages, 5¾ by 8½ in., illustrated. Price, $4.50. Published by American Technical Society, Chicago, Ill.

A comprehensive book containing information on materials, jigs, fixtures, commercial and design standards, cutting tools, methods of tooling up, dies and gauges, all of which must be made part and parcel of a tool desinger's equipment if he wants to succeed in industry.

Machine Shop Mathematics

By Aaron Axelrod. Cloth, 368 pages, 6¼ by 9¼ in., illustrated. Price, $2.50. Published by the McGraw-Hill Book Co., New York City.

An attempt to apply the knowledge of mathematics which the student has acquired from his general course in mathematics to the specific needs of the machinist.

The book is divided into 12 units which are respectively devoted to measuring tools, weights and measures, measurements, geometric constructions, graphical charts, shop trigonometry, belting, pulleys and gears, speeds and feeds, lathe work, gear calculations, and milling-machine work.

A review of algebra is appended, as are also a number of useful tables.

Elements of Aeronautics

By Francis Pope and Arthur S. Otis. Cloth, 660 pages, 5¼ by 8¼ in., illustrated. Price, $3.40. Published by the World Book Co., Yonkers-on-Hudson, N. Y.

Each chapter, of which there are 46, is accompanied by a number of questions which may be used for study or discussion.

Several mathematical tables, which will be found useful in solving the problems contained in the book, have been appended. A hard paper protractor is also furnished with each book.

Reading Aircraft Blueprints

By Francis L. Goff and Lloyd R. Novak. Paper, 76 pages, 6 by 9 in.; 45 blueprints, 7½ by 9⅞ in.; and 5 inserted blueprints, 18¾ by 14 in. Price, $2. Published by McKnight & McKnight, Bloomington, Ill.

A 76-page descriptive booklet on the reading of blueprints made for the aircraft industry. This booklet is accompanied by 50 blueprints from which the student can learn how to read the working drawings used by the aircraft mechanic.

Aircraft Detail Drafting

By Norman Meadowcroft. Cloth, 211 pages,

(Continued on page 34A)

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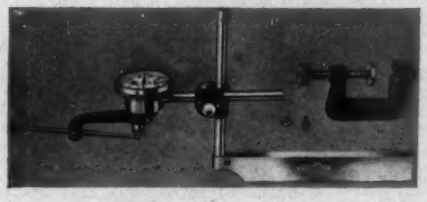

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Higgins Eternal Black Writing Ink, noted for its intense blackness and permanence, is now used for V mail.

V mail is photographed down, and then enlarged up, and to be legible after this the writing should be clean, clear cut, and above all *black*.

Higgins Eternal Black Writing Ink may be used in fountain pens as well as with the dip pens. The ink photographs well for V mail and is useful also for vital records since neither heat, chemicals, nor the wetting which accompanies fire and bombing can destroy the legibility of the writing.

For brief reference use IAVE—211.

MIDGET AIR CLAMP

The Mead Specialties Co., 15 S. Market St., Chicago, Ill., announce the new Midget Air Clamp for assembly jigs and other multiple applications. This pressure unit was designed ex-

Midget air clamp

pressly for the aircraft industry. It promises to save countless man hours in all operations involving the joining by welding, riveting, or bolting of two or more component parts of any assembly.

Certain definite advantages over mechanical clamps are apparent:

1. All air clamps in any setup can be operated by a single master valve, whether there be two or several hundred in the operation involved. The *lockup* and *release* of assemblies is instan-

(Continued on page 32A)

TESTORS

CEMENT AND DOPE FOR MODEL AERONAUTICS

FIRST CHOICE OF AMERICA'S MODEL BUILDERS

No. 2 in a Series on Principles of Better Craftsmanship

*HOW TO MAKE STRONG MORTISE JOINTS

* A snug, smooth fit is most desirable because then the cement can produce the best bond. It should take a slight push to fit the pieces together. On the slot, or open mortise, shown here, place only a moderate amount of cement on the sides of the slot, and push the mating piece in firmly. After the bond dries, an "envelope" of cement may be added over the top or all around the joint. A little cement on a good fit is far better than a gob of cement used to fill-in for sloppy workmanship.

You will find these practical data sheets a helpful guide for your classes. May we suggest that you save and file the entire series.

Now! Get complete details about Testor's Model Airplane Cements and Dopes

TESTOR CHEMICAL CO., ROCKFORD, ILLINOIS, U.S.A.

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"MACHINE-OF-THE-MONTH"

No. 23 Grinder

Single or 3-phase geared motors operate spindles at just 500 r.p.m. 6" dia. x 2" face cup wheels — one fine, one coarse. Also high speed cone wheel for grinding gouges, and ½" high-speed wheel. Automatic coolant feed.

Here's the *safest* oilstone grinder for woodworking shops, — safe for tools, safe for the operator! Reduced wheel speed of 500 r.p.m. prevents burning of carbon steel used in fine hand tools, — also eliminates danger of flying emery and exploding wheels, common with cheaply-built high-speed units.

It's a Wallace quality-built product. Write today for bulletins — we also manufacture quality universal saws, jointers, bandsaws, lathes, mortisers, cut-off saws, glue pots, etc.

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WEIDENHOFF DISTRIB-U-SCOPE

Just as you need a micrometer for precision measurements or a machine for dynamically balancing wheels and tires, you need this ignition distributor testing and correcting instrument. The distributor is at the bottle neck of good ignition — it must be mechanically and electrically correct for smooth powerful engine performance.

The Distrib-U-Scope completely checks cam wear, point bounce, shaft wear, dwell or cam angle, synchronization of two sets of breakers, governor and vacuum control, spark advance, etc. You actually see an electrical picture of the distributor action from low to high speed. Tells you what is necessary and shows if the service work has brought the distributor up to factory standard.

Write for a copy of the Weidenhoff Bulletin on the Ten Hundred Series, Distrib-U-Scope. It gives valuable information and hints on the various types of distributors and their service requirements. One the most comprehensive works written on ignition distributors. It's yours for the asking.

BUY WAR BONDS

Joseph Weidenhoff, Inc.
4340-58 W. Roosevelt Road
CHICAGO, U. S. A.

(Continued from page 30A)

taneous. This feature can save many minutes on each unit, even on small and simple assemblies.

2. The compact size of the Midget Air Clamp permits installation in cramped corners difficult to reach with more bulky mechanical clamps.

3. Special delicate adjustments are unnecessary, since the air clamp ram holds with equal pressure at any point along its stroke.

4. Any desired group of *Midgets* can be controlled independently of any other groups in a given assembly. For example, in assemblies where certain primary numbers require locking up before secondary numbers are laid in, the primary numbers can be controlled by one master valve, and the secondary numbers by another valve, and so on.

5. Many kinds of light bench assembly jobs and delicate drilling operations can be facilitated by the use of Midget Air Clamps actuated by foot control valves. This leaves both of the operator's hands free to handle the work pieces.

The Midget Air Clamp delivers 80 lb. pressure on a line pressure of 100 lb. The stroke of the ram is 5/8 in. An internal return spring withdraws the ram when air is exhausted from the cylinder by the control valve.

For brief reference use IAVE—212.

VISUAL LEARNING GUIDES

The National Audio-Visual Council, Inc., 160 N. LaSalle St., Chicago, Ill., have prepared learning guides to be used with the training films prepared by the U. S. Office of Education.

These guides assist the student to prepare for what the film is to teach, furnish him with a permanent record of what the film has taught, and also provide test and discussion questions to help him get the fullest understanding of the subject or subjects that have been presented.

Visual Learning Guides now available cover: precision measurements — steel rule, micrometer, fixed gauges, verniers, height and test gauges and indicators; engine lathe — turning between centers, cutting tapers, drilling and reaming, and cutting external threads; milling machine — cutting keyways, surface and straddle milling, indexing, and spur gear cutting.

Other Visual Learning Guides now in preparation cover the sensitive drill, radial drill, vertical drill, shaper, centering and layout, benchwork, action of single point cutting tools, and vertical boring mill.

For brief reference use IAVE—213.

NEW TEACHING AIDS

Behr-Manning (Division of Norton Co.), Troy, N. Y., are distributing a 6 by 9-in. attractive wall card, which acts as a constant reminder that "Sandpaper Is a Tool, Use It Carefully."

The card is printed in red and black. Instructors may obtain these cards, free of charge, for shop and classroom use.

The firm is also distributing a brilliant orange and black file folder containing (*a*) two ready-to-use class projects — "Coated Abrasives in the Machine Shop" and "Oilstones Used in the Machine shop"; (*b*) a "Use Chart" on coated abrasives for metalworking; (*c*) a booklet for related reading — "Sandpaper, Its How and Why."

For brief reference use IAVE—214.

OHM'S LAW CALCULATOR

This handy Ohm's law calculator was specially designed by Ohmite engineers. It solves any Ohm's law problem with one setting of the slide, and simplifies and speeds up the solving of many electrical problems. Requires no slide rule knowledge. All values are direct reading. Simple instructions appear on the calculator.

This calculator is especially helpful today to teachers, students, trainees, engineers, electricians, maintenance men, laboratory and development men, and the like.

It has scales on two sides, and covers the range of currents, resistances, wattages and voltages commonly used in electrical, electronic, and radio applications. May also be used to find parallel resistance and series capacitance.

To get one of these Ohm's Law calculators send 10 cents to the Ohmite Manufacturing Co., Department 8S, 4835 Flournoy St., Chicago, Ill.

For brief reference use IAVE—215.

PRACTICAL HELPS FOR WAR-PRODUCTION TRAINING

The South Bend Lathe Works has prepared a four-page, four-color circular, No. 21–C, which contains a brief description of their motion-picture films, instruction books, bulletins, wall charts, and blueprints on lathe operation. This circular also offers sample copies of several publications without cost to those in charge of apprentice training and instruction in shopwork.

Write for your copy of this circular to South Bend Lathe Works, South Bend, Ind.

For brief reference use IAVE—216.

VERTICAL HYDRO-TEL MILLER

The Cincinnati 28-in. series of Vertical Hydro-Tel milling machine is completely described in a new, 24-page, specification booklet that has been prepared by Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio.

The material is well illustrated, and the description covers both the construction of the machine as well as the various types of work that can be done on the machine.

A general specification table gives the main dimensions of the various sizes manufactured.

For brief reference use IAVE—217.

(Continued on page 34A)

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Bulletins of the Summer Session may be obtained by writing to the Director of Summer Sessions,
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are somewhat curtailed in school programs but we can still help you by supplying small tools and supplies.
Catalog IA sent to teachers of Industrial Arts who specify school connection.
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10 Thomas St. Providence, R. I.

(Continued from page 32A)

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New Publications

(Continued from page 29A)

6¼ by 9¼ in., illustrated. Price, $2.25. Published by McGraw-Hill Book Co., New York City.

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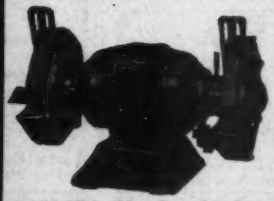

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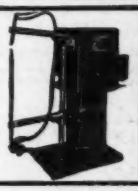

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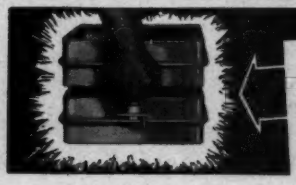

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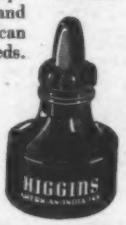

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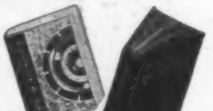

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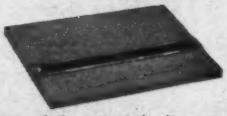

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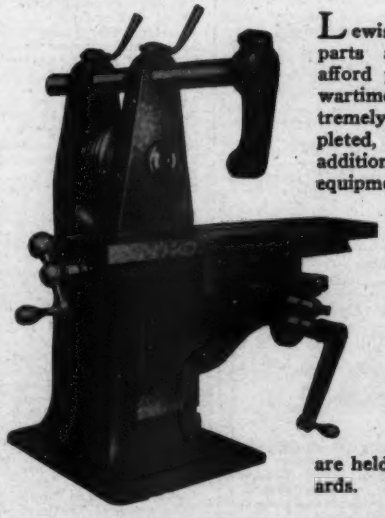

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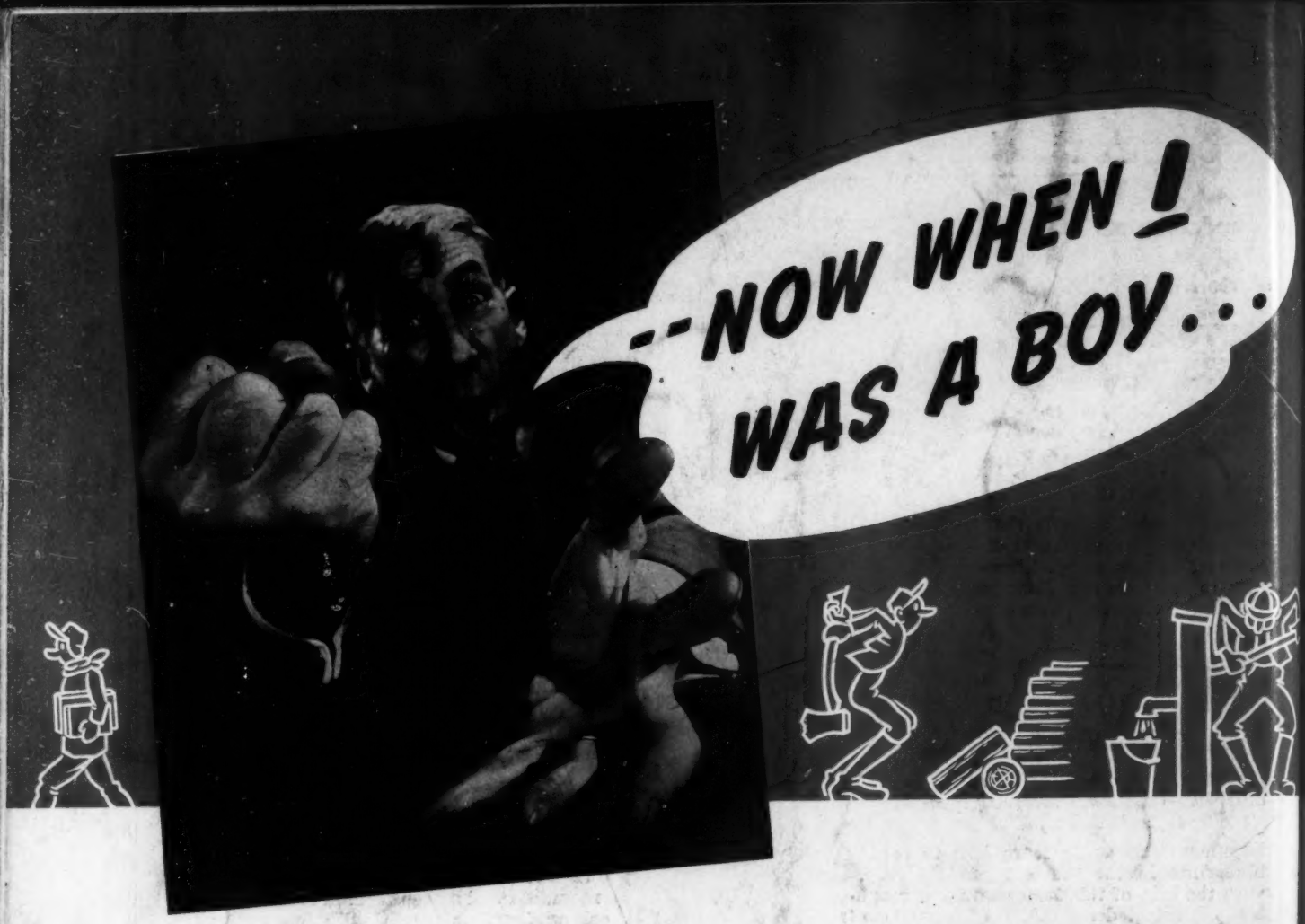

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